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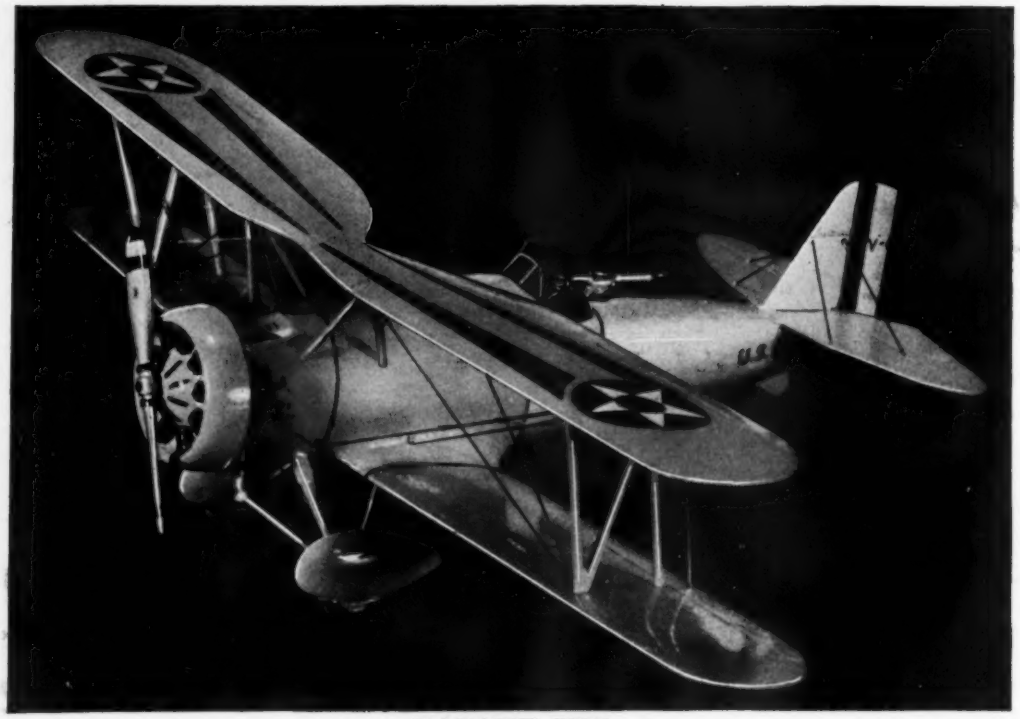

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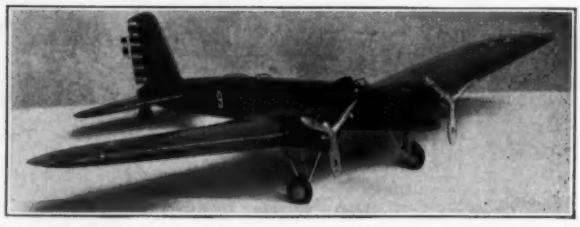

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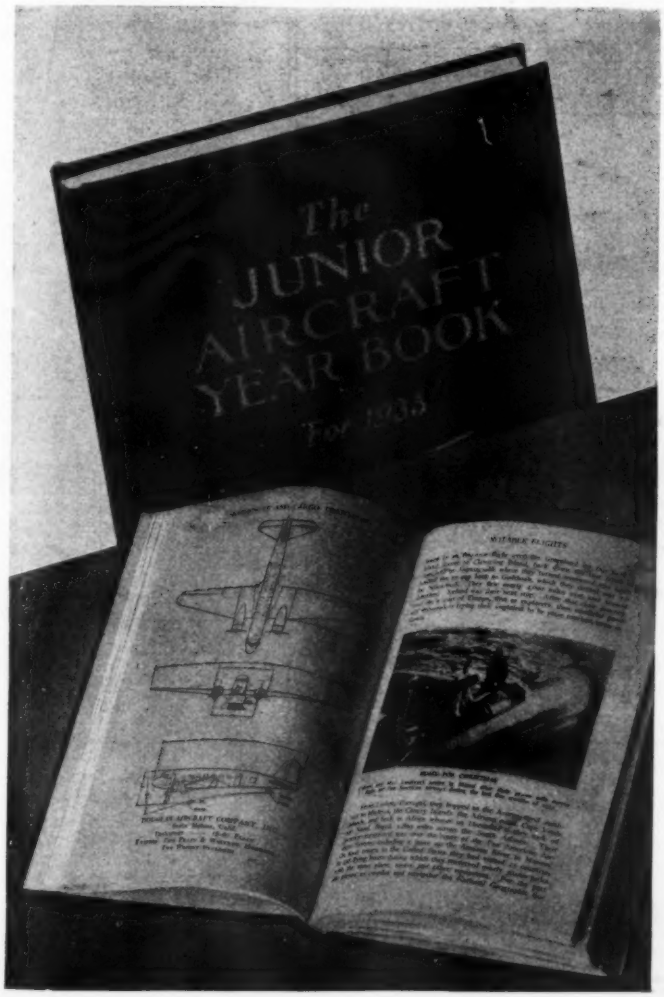

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Model AIRPLANE News

7th YEAR OF PUBLICATION

VOL. XIII *NO. 1*

Edited by Charles Hampson Grant

CONTENTS

AUGUST, 1935

Airways of Tomorrow
By Lieut. H. Latane Lewis II 4

The Curtiss Swift P-31 (3 View)
By W. A. Wylam 6

Make This Scale Model Glider from Scrap Wood
By Jesse Davidson 7

The Development of the Fokker Fighters—Part No. 14
By Robert C. Hare 8

A Flying Scale Model of the Consolidated Fleet Trainer
By Elmer Pilzer 10

Secrets of Good Model Building—Part No. 1
By Howard G. McEntee 13

On the Frontiers of Aviation
Including: How to Build a Scale Model of the Pitcairn Autogiro PA-33 (3 View)
By Robert C. Morrison 14

Airplane Observers Contest Winners 17

An American "Wakefield" Entry
By Frank Zaic 19

Air Ways—Here and There 22

Douglas Mailplane M-2
By Willis L. Nye 26

Aerodynamic Design of the Model Plane
By Charles Hampson Grant 27

An Automatic Variable Pitch Propeller
By C. L. Bristol 28

How to Make a Simple Tailless Sailplane
By William Krames 28

N.A.A. Junior Membership News 29

Aviation Advisory Board 32

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In Our Next Issue

Fletcher Pratt tells some interesting facts about the development of the new German Air Force in, **Is Germany Prepared in the Air?**

Building a Flying Waco Cabin Model, by Wm. Winter and Walter McBride shows you how to construct an excellent model of a remarkable airplane, which will give unusual performance.

Gordon Light tells you how to build a clever three purpose twin propeller model of proven performance in **How to Build a "Twin" Amphibian.** Don't miss this one.

Also, Mr. Davidson provides many enjoyable hours to the beginner or expert by giving data and patterns which will enable you to build a ¾" scale silhouette glider of the Monocoupe in **A Silhouette Monocoupe Glider.**

Mr. McEntee tells you some more helpful facts about fuselage design in **Secrets of Good Model Building—Part No. 2.**

Many other interesting features will be presented also in, **On the Frontiers of Aviation, The Aerodynamic Design of the Model Plane, Detail 3 View Layouts, Aviation Advisory Board, A Model That's Easy to Build and Fly,** and **Air Ways** and **N.A.A. Junior Membership News,** which will give you complete information of the 1935 National Model Airplane Contest, to be held in St. Louis.

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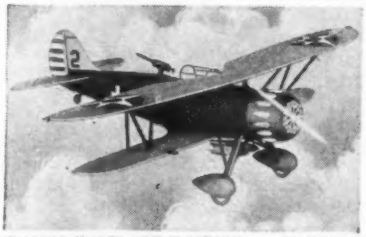

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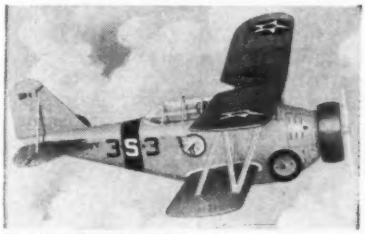

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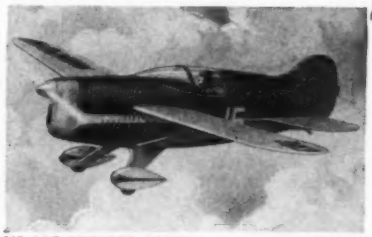

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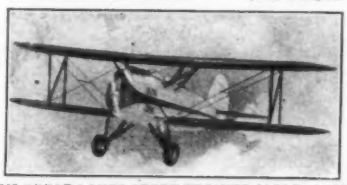

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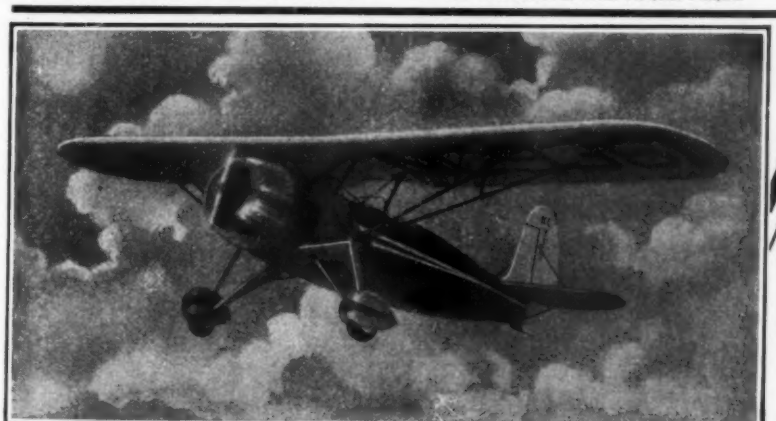

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Airways of Tomorrow

Advantages of Stratosphere Flying. Some of the Problems It Presents and How Many of Them Have Been Solved

The author, Lieut. H. Latane Lewis II

AIRLINERS of the future will fly high and fast. Fifty miles above the earth lies an ideal airway with winds of close to 200 miles per hour constantly blowing from east to west, caused by the rotation of the earth. If an airplane could climb high enough to ride that gale, terrific speeds would be possible.

Moreover, the air thins out at such heights and cuts down resistance. It is hard for us to estimate just how fast a given horsepower would drive a given ship at this extreme altitude, but we do know that at 40,000 feet a plane will travel almost 50 percent faster than at sea level, if the same power is provided.

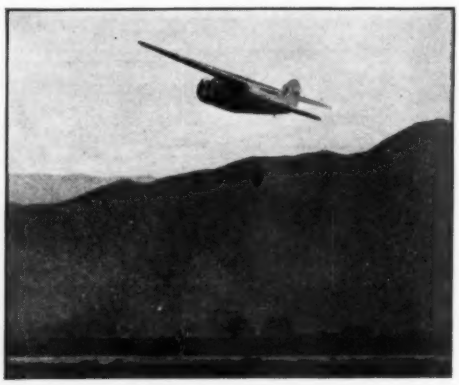
The stratosphere is the layer of air above the atmosphere. It begins at the point where the thermometer stops falling and the temperature becomes constant—at a height varying from seven to ten miles above the earth. There are no clouds there, nor fog, nor storms, because no water vapor is present in the air. Weather conditions do not vary.

Nature, then, has provided us with perfect conditions for flying in this high, wind-swept airway. The problem is, how can we reach it? Moreover, what about the human element? How high can a man go and still remain alive?

These problems are receiving a great deal of attention from the whole aeronautical industry. Commercial airlines are interested because it means quicker transportation. The Army and Navy are interested because in air fighting, the man on top has the advantage.

Designers have agreed upon one point. That is that the answer must be in the form of airplanes with hermetically sealed cabins. It has been found that life cannot exist in the open above 50,000 feet, even while taking artificial oxygen. Captain Hawthorne Gray of the Army rose to 42,000 feet in the open basket of a balloon. As he ascended higher and higher, his life fast ebbed away from the effects of the thin air and when his balloon returned to earth, his lifeless body was found slumped over his instruments. Major R. W. Schroeder ascended to 33,000 feet over Wright Field in the open cockpit of an airplane and lost consciousness. His plane tumbled straight toward the earth for 6 miles and just before it would have crashed, "Shorty" miraculously regained consciousness and managed to level off. X-ray pictures of his heart showed that it had expanded until it was 3 times normal size. His eyeballs were frozen and he spent sometime in a hospital.

The reason that human life cannot exist at extreme altitude is the lack of atmospheric pressure. Deep-water fish when brought to the surface expand and their eyes bulge. While men don't behave quite like that, we are used to a pressure of 14.7 pounds per square inch on every portion of our bodies and when this pressure is reduced to practically nothing, it causes our organs to dilate. The lungs and heart suffer the most, and even though death may not result, irreparable damage may be done.



Wiley Post drops his landing gear at the start of his recent stratosphere flight

Army officers have put rats and other animals under bell-jars and while feeding them sufficient oxygen to keep them alive, have reduced the pressure. These animals have all turned up their toes and died at pressures corresponding to about 47,000 feet.

Not a diver but Wiley Post in his stratosphere suit ready for his recent flight

Several flyers have proposed to overcome this condition by tightly taping their bodies, including Colonel Emilio Herrera of the Spanish Air Force who is planning a flight into the stratosphere in an open balloon basket. This method, however, is not believed to be wholly practicable and certainly would not be possible on passenger-carrying planes.

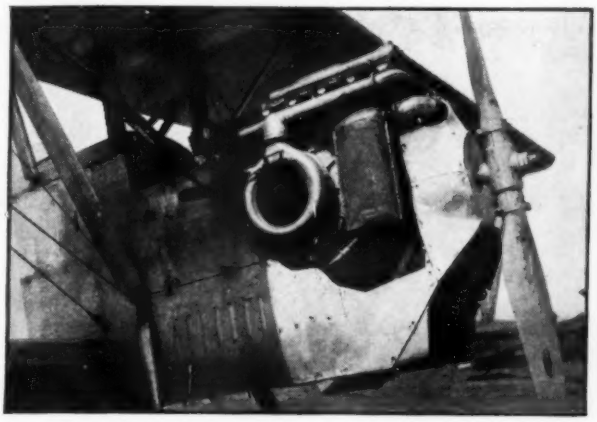
The first of the air-tight cabins was tried out at Wright Field some years ago. This cabin, mounted on a DH, was provided with a compressor which was designed to gather in the air and keep the pressure approximately that of sea level. However, it was not found to be satisfactory for the pressure became so great that it almost crushed the pilot to death. Recently, the Farman Company in France constructed a stratosphere plane utilizing this principle. By providing 3 compressors it is believed that the disadvantages of the Army ship will be overcome. One compressor is for use at 16,000 feet, another for 32,000, and still another for 49,000 and above. The plane is designed to reach an altitude of 65,000 feet and to cruise at a speed of about 360 miles per hour.

Facts that are of tremendous value in harnessing the stratosphere for practical use are learned from balloon flights. Major Bill Kepner's stratosphere hop last summer brought about the development of the finest equipment yet devised. This equipment can also be used in the hermetically sealed cabins of airplanes.

The oxygen apparatus used by Kepner was composed of 3 vacuum-insulated metal flasks, each with a capacity of about 2½ quarts. In open cockpits, pure liquid oxygen can be used but in an enclosed cabin there is great danger of fire. Fire in the presence of oxygen burns at a rate of speed almost equal to that of an explosion and if a flame should be started by an electric spark, or a spark from friction, there would be no hope of putting it out. Therefore, a mixture of about 50 percent oxygen and 50 percent nitrogen was used.

It was found that without the use of a compressor, the constant expansion of the oxygen into the gondola kept the pressure up to a livable point. In fact, the pressure actually became too great and had to be reduced by means of valves.

Carbon dioxide gas, given off as the men breathed, was absorbed by chemicals carried in steel screens on the sides of the car. A dehumidifying apparatus was also carried to condense the moisture in the



Latest U.S. Army Air Corps side type supercharger on a special altitude plane, X CO-5A

Pouring liquid oxygen into a flask carried by Maj. Kepner on a flight into the stratosphere

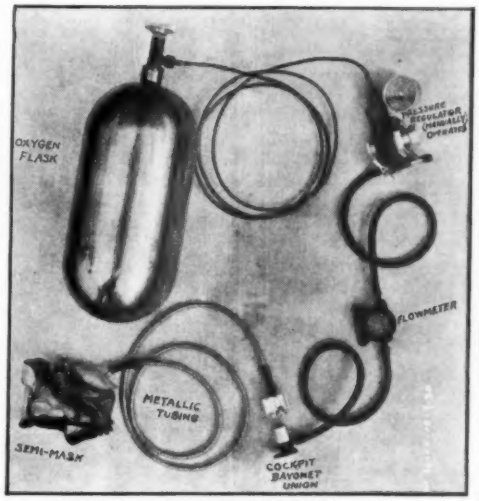
air and keep it from becoming too great. All of these devices can be used on an airplane.

But, after all, what good are the ideal conditions in the stratosphere and the ingenious equipment designed for use there, if airplanes can't reach it? The highest that any have been able to go so far is just 47,352 feet. As airplanes get farther and farther away from sea level, their engines lose power rapidly. An engine that develops 400 horsepower at the surface will develop only 87 horsepower at 25,000 feet and from that point on the decrease is even more rapid. This problem is being overcome by improvements in the supercharger, which is a little apparatus designed to feed air at sea level pressure to the carburetor of the engine.

The latest type supercharger consists of a turbine which is driven by exhaust gases from the engine. This turbine revolves at the terrific speed of 25,000 revolutions per minute and operates a compressor not unlike an ordinary electric fan. The compressor rapidly gathers in air which it feeds to the carburetor. This keeps the gas mixture from becoming too "rich" and enables the engine to develop full horsepower in spite of the rarified air.

High altitudes have a peculiar effect on the human system. The most noticeable is the lowering of mental alertness. Pilots frequently have difficulty in reading their instruments intelligently and they find themselves fumbling about with the controls in a half-asleep fashion. The sky looks dark and they feel depressed. The slightest motion, such as reaching forward to adjust the flow of oxygen, fatigues them. A few whiffs of the precious gas, however, quickly snaps them back to normal.

At present there are no airplanes with hermetically sealed cabins being produced in this country, although several are under consideration. The United States Navy has been doing excellent work in exploring the upper air in open cockpit planes and the pilots of the Flight Test Section at the Anacostia Naval Air Station deserve the highest praise for their pioneering efforts, often at great risk to their own lives.



Individual oxygen equipment for pilot

Several years ago, Navy engineers developed a very simple and efficient individual feed type apparatus.

The initial supply of oxygen is carried in a flask at a pressure of about 120 atmospheres, or 1,800 pounds per square inch. This tremendous pressure would be dangerous indeed if it were suddenly released, but before the oxygen is fed to the pilot it is led through heavy walled copper tubing to a regulator which reduces the pressure until it is suitable for breathing. This regulator is within easy reach of the pilot and he can adjust the flow to suit his needs, a flowmeter being provided to indicate the actual rate at which oxygen is being supplied. After the oxygen has passed through the regulator, it is led through low pressure rubber tubing to a pipe-stem on the outlet tube, which is held between the pilot's lips.

For moderately high altitude work, most pilots prefer to "smoke" the oxygen. This is the simplest method since it permits the individual to breathe freely of the outside air at the same time that he is being provided with a concentrated supply of additional oxygen, and he is able to adjust the percentage of oxygen that he is taking.

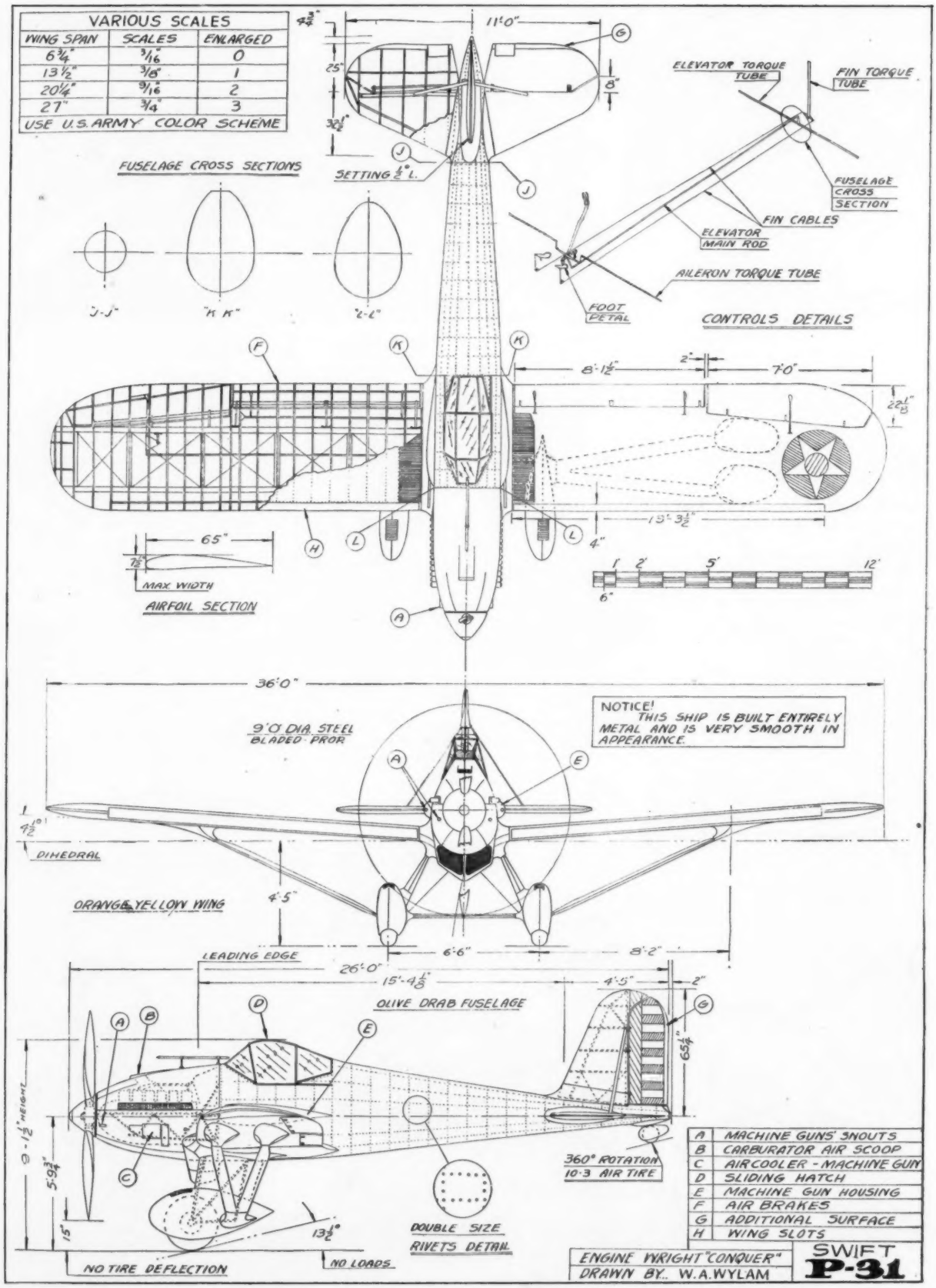
Most men can function reasonably well at altitudes up to 20,000 feet, but the practice that the Navy has found most advantageous is to start the supply at about 15,000 feet on the ascent, cutting it off at about 12,000 feet on the descent. Used in this way, the pilot is able to avoid the nausea and headache that usually follow a trip to the outer core of the earth's atmosphere.

While these open cockpit flights are providing invaluable data on the airways of tomorrow, the real future of air transportation lies in the high-flying plane with the air-tight cabin and it is towards this that the aviation world is looking.

The picture directly to the left shows how an open cockpit plane has been equipped with a sealed cabin which shields the pilot from cold, excessive changes in air pressure and insures a means of retaining a proper oxygen supply.

At this time many countries are experimenting with cabin type stratosphere plane but as yet have not satisfactorily surmounted all of the tremendous obstacles involved. We await future developments with interest.

A sealed cabin on a stratosphere plane to combat rarified air and cold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65"
MAX WIDTH
AIRFOIL SECTION
36'0"
9'0" DIA. STEEL BLADED PROP
NOTICE! THIS SHIP IS BUILT ENTIRELY METAL AND IS VERY SMOOTH IN APPEARANCE.
DIHEDRAL
ORANGE & YELLOW WING
LEADING EDGE
26'0"
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OLIVE DRAB FUSELAGE
9'-1½" HEIGHT
5'9¾"
15"
13½°
NO TIRE DEFLECTION
NO LOADS
DOUBLE SIZE RIVETS DETAIL
360° ROTATION 10-3 AIR TIRE
A MACHINE GUNS' SNOUTS
B CARBURATOR AIR SCOOP
C AIR COOLER - MACHINE GUN
D SLIDING HATCH
E MACHINE GUN HOUSING
F AIR BRAKES
G ADDITIONAL SURFACE
H WING SLOTS
ENGINE WRIGHT "CONQUER"
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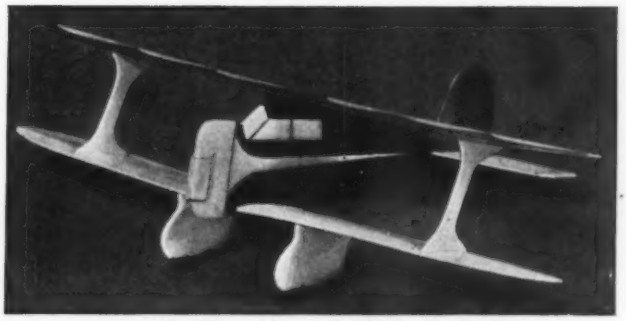
SWIFT P-31

Make This Scale Model Glider From Scrap Wood

Here Is a Very Realistic Scale Model Beechcraft That Is Easy to Build and Which Flies Beautifully



The glider decorated to look like its big brother

By JESSE DAVIDSON

WE ARE sure you enjoyed building, painting and flying your Stinson Reliant silhouette-o-plane, drawings of which appeared in MODEL AIRPLANE NEWS for July. Equally certain now are we that you will enjoy the diversion of constructing the Beechcraft Glider. Painted in strong, bold colors, it presents a pleasing sight; not only while resting on your model airport, but also when it is in flight; for this little ship will really fly beautifully.

Being true to scale (3/16" = 1'), it is very realistic. You can build it easily from odd sheets of balsa, so get busy. All parts composing the model are listed at the end of the article.

The pattern of the wing, side view of fuselage, rudder, elevator, wheel pants, wing struts, rib and fillet strip, are the main parts of the model and are shown in black. These patterns may be cut out from this page to lay onto the wood and their outlines traced, or tracing paper may be used to transfer the outlines of these patterns onto the wood. The use of the latter method is suggested so as not to mutilate the page of this magazine.

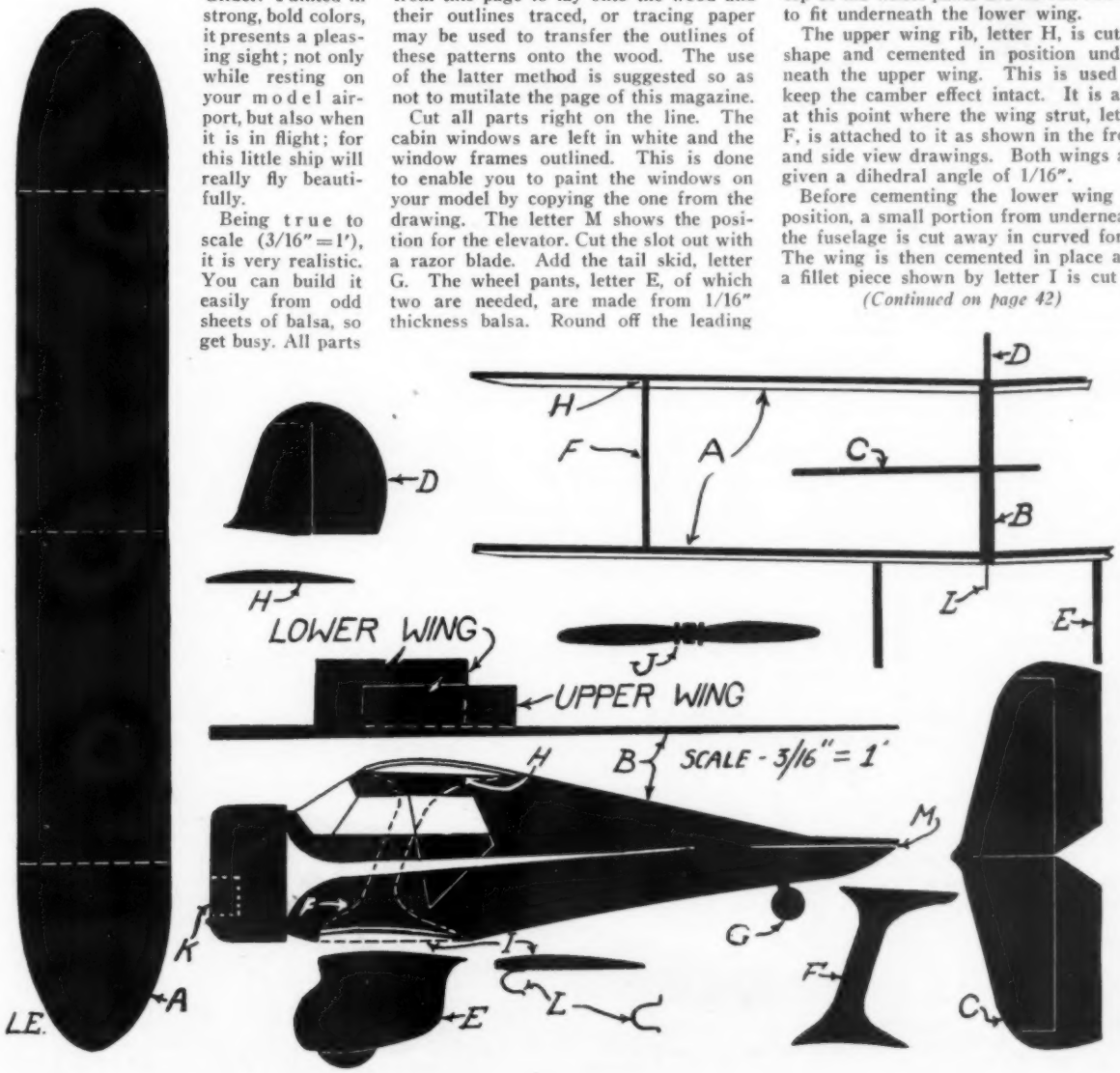
Cut all parts right on the line. The cabin windows are left in white and the window frames outlined. This is done to enable you to paint the windows on your model by copying the one from the drawing. The letter M shows the position for the elevator. Cut the slot out with a razor blade. Add the tail skid, letter G. The wheel pants, letter E, of which two are needed, are made from 1/16" thickness balsa. Round off the leading edges and taper the rear ends slightly to give a streamline effect.

The pattern of the wing is lettered A. Both upper and lower wings are identical in chord and length. Camber each to the curve shown on the side view of the fuselage. You will notice also that the top of the wheel pants are curved exactly to fit underneath the lower wing.

The upper wing rib, letter H, is cut to shape and cemented in position underneath the upper wing. This is used to keep the camber effect intact. It is also at this point where the wing strut, letter F, is attached to it as shown in the front and side view drawings. Both wings are given a dihedral angle of 1/16".

Before cementing the lower wing in position, a small portion from underneath the fuselage is cut away in curved form. The wing is then cemented in place and a fillet piece shown by letter I is cut to

(Continued on page 42)



The experimental Fokker V.25 was ahead of its time

The Fokker V.27, forerunner of the D.8

The Development of The Fokker Fighters

How an Efficient Observation Plane Was Developed from the D.VII and Interesting Points of the Forerunners of the Famous D.VIII Type

By ROBERT C. HARE

PART 14

IN MARCH 1918, the principal German aircraft manufacturers were preparing to produce quantities of the Fokker D.VII biplane, a standardized type on which the Imperial Air Service concentrated its production facilities.

At the same time, General von Höppner, head of the German air corps, saw a need for a similarly standardized observation-fighter machine to fly with the D.II staffels, and to work in a capacity comparable to the British Bristol F2-B. Since no existing German two-seater could meet these requirements, the solution to the problem lay in a new design.

Similarly, the only factory not cluttered with D.IIs was the Fokker works at Schwerin, so Anthony Fokker was asked to design a two-place machine which could incorporate D.VII parts because of their abundance in each factory.

According to specifications drawn up by Fokker and approved by von Höppner's engineering staff, the first Fokker two-seater observation fighter was put into production at the Schwerin establishment. Because the already numerous D.VII fittings were available to the new machine, the two-seater left the shops in record time, and late in March 1918, took off on its first flight.

This was the only biplane machine Fokker designed and built for combat and observation work at the Front.

In general appearance, the Fokker C.I, as the new machine was called, resembled an enlarged D.VII. While many of the fittings were plagiarized from the latter design, the C.I held many points of interest which show to what means designers appealed at that time to improve on the performance achieved by their contemporaries.

In method and manner of construction, the fuselage of the Fokker C.I was typical of previous designs emanating from the Fokker plant. Two side fuselage outlines of steel tubing were placed in a right and left jig, heat treated and welded together. Four or five men were commissioned to work on one fuselage, and as the various cross and upright bracing members were welded together, the form was moved on its stand to receive another set of bracings. The fuselage was braced with steel wire and secured under tension by turnbuckles, tested for alignment.

The landing gear was then locked into position. Instead of the usual hollow wing-axle as provided on the D.VII type of Fokker, the C.I carried its gasoline tank in the identical place. Two pneumatic tires size 760/100 completed the landing gear. The tread was 6 feet, 0 inches, and the gear weighed complete, without fuel in the tank, 105 pounds, 7 ounces.

A B.M.W. IIIa six-cylindered vertical water-cooled engine of 185 hp. (at 1400 r.p.m.) powered the C.I. A regular D.VII type radiator formed the nose of the first C.I, but later editions of this machine were fitted with an oval-shaped radiator as shown on the plane in Figure 1. This type of radiator was equipped with a special thermostatically controlled shutter arrangement which was intended to keep the motor at a constant temperature during combat.

Characteristic of Fokker design was the biplane cellule of the C.I which was of the cantilever type employed on previous models. The greater part of the 35 ribs in the top plane, were built from D.VII jigs. In the lower plane, many of the 32 ribs were of the D.VII type.

At the center, the front and rear spars of the upper wing measured respectively 222x76 millimeters and 170x75 millimeters while the respective lower plane spar dimensions were smaller in direct proportion. Piano wire was used for internal bracing.

Regular Fokker D.VII ailerons were fitted to the upper wing only of the C.I. Steel tubing 10 millimeters in diameter formed the outlines with rib stock of the same material. Steel wire was used for the trailing edge.

A standard Fokker D.VII tail assembly was incorporated in the C.I design, thereby effecting a great economy in construction. Steel tubes 15 millimeters in diameter formed the outline of the stabilizer. The elevator tubes were 10 millimeters in diameter; rudder outlines the same stock.

Only one external strut was incorporated in the tail assembly on the underside of the stabilizer. Exceptional strength of the fin in its internal structure did away with outside wiring.

Armament of the original C.I included two air-cooled Spandau machine-guns mounted forward of the pilot in precisely the same relative position as on the D.VII. The observer was provided with one Parabellum machine-gun mounted on a movable ring which formed the rim of the cockpit. A simple lock held the gun ring in any given position while a separate lock was used to hold the gun itself at the correct angle of fire. When not in use, the gun muzzle snapped into a clip which held it diagonally across the fuselage out of the way.

While the Fokker C.I was not a radically designed airplane, in its structure were incorporated many ideas to which we owe credit for our present day excellence of aircraft construction.

Distinctly an innovation of this type that has made its influence felt in the form of the modern "belly" gasoline tank, was the landing gear fuel reservoir of the C.I. Fuel was forced into the carburetor under pressure supplied by a small pump. A series of tests in flight, demonstrating the outside fuel tank, was recorded on moving picture film by the Fokker staff in order to confirm their belief that such a tank would greatly reduce the hazards of fire in the air.

When the tank was dropped in flames, the machine being tested was saved in every case. An aux-

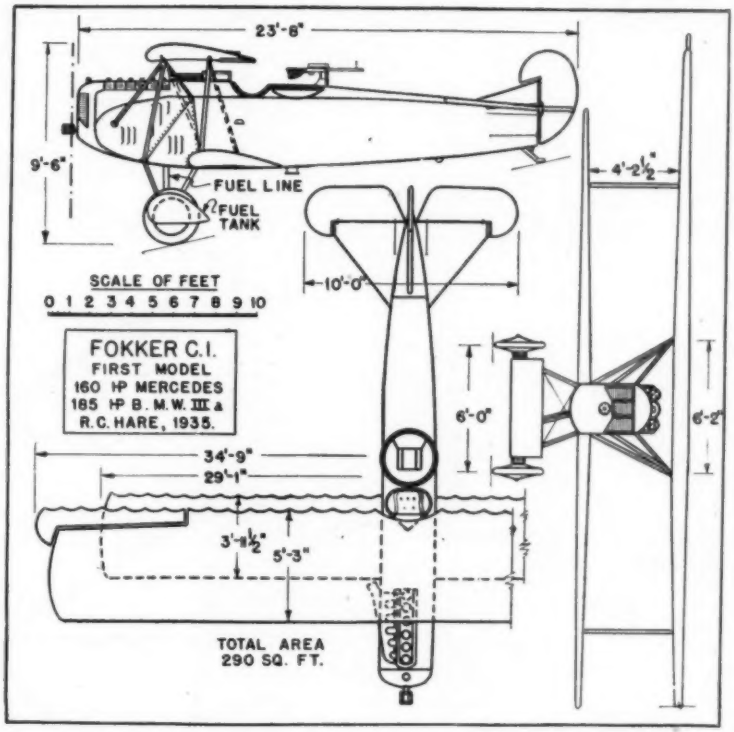
The Fokker C.I, a biplace observation plane developed from the famous D.VII type

The Fokker V.24, very similar to the D.VII, but lighter and of higher performance

The Fokker C.Vd, a descendant of the C.I type, fitted with a Jupiter Engine

iliary fuel tank of the nonleak type was provided to take the pilot to his landing field after the tank was dropped.

Like so many other German types that have remained hidden since the Armistice, the Fokker C.I. had been denied and doubted until Anthony Fokker confirmed its actual existence at one time. The actual number of C.I machines constructed by Fokker is not known since at the Armistice they were in all stages of construction. It is known, however, that no less than sixty machines of this type reached the flying stage. Several of these Fokker C.Is are still flying after their conversion into commercial craft after the War.



In regard to performance, the Fokker C.I was an exceptionally fine airplane. With the B.M.W. IIIa motor, the C.I was able to go 115 m.p.h. at 6,600 feet with full load. Landing speed was only 45 m.p.h. with full load, while the climb to 4,000 feet took just 4 minutes and 40 seconds. Fourteen minutes were required to reach 10,000 feet.

This performance as compared to British and French figures for machines of the same category was very good in view of the fact that Allied machines averaged only 117 m.p.h. at 6,600 feet while using engines some 40 hp. greater.

It can be said then that the Fokker C.I was perhaps more efficient than its cousin, the D.VII.

Like the D.VII, the C.I was able to "hang" on its propeller, giving the pilot a chance to pot-shot anything in front of him, and allowing the observer to use a steady gun carriage in every direction, and at the same time get a good look at the situation.

Figure 2 shows a direct descendant of the Fokker C.I, the Fokker C.Vd, Jupiter engine. It will be noticed that in this photograph the wings and engine only have been replaced. Fuselage, rudder, elevator and landing gear have been altered only in detail; the same general design has prevailed through the years. What could be a higher tribute to the C.I design and to Fokker himself?

Although Fokker was entirely satisfied with the D.VII and its performance in service tests, he put one D.VII aside for experimental purposes.

This extra D.VII was known as the V.24 and differed from the former machine in points of minor outside detail only. A new type close-fitting cowl was built on the V.24 which allowed the exhaust stack to be led outside the cowl just in front of the fire wall. All subsequent manifolds were internal and out of the slipstream.

By means of other modifications, the V.24 that was turned out was slightly lighter than the D.VII and was capable of a greater radius of action. The ceiling was increased over that of the D.VII, and it maneuvered more easily. Provision was made for only one Spandau machine-gun. Except for being an interesting experiment, the V.24 remained of no particular military significance.

March 1918 saw two experimental Fokker monoplanes leave the Fokker Flugzeugwerke at Schwerin, the first of these machines being a small low-wing cantilever monoplane.

Although resembling in some details earlier Fokker types, the V.25 again opened the field of light rotary-powered fighting types for single-seater aircraft.

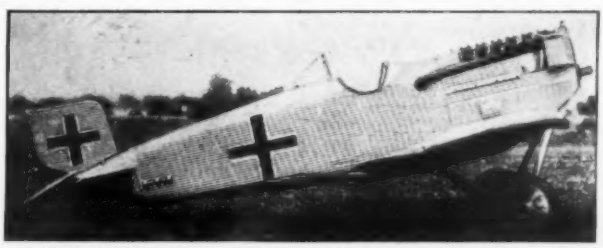
The fuselage of the V.25 was constructed of steel tubes ¾" in diameter in the forward portion and after a splice behind the cockpit, longerons narrowed down to ⅝" in diameter. Uprights throughout were of corresponding sizes. Steel wires run double around quadrants braced the body as in previously described designs.

Fairing behind the motor consisted of a wooden stringer covered with plywood on either side and an aluminum deck on the top portion of the body. Plywood covered with cloth on the top, and fabric on the bottoms and sides, completed the covering. A large headrest completed the fuselage streamlining.

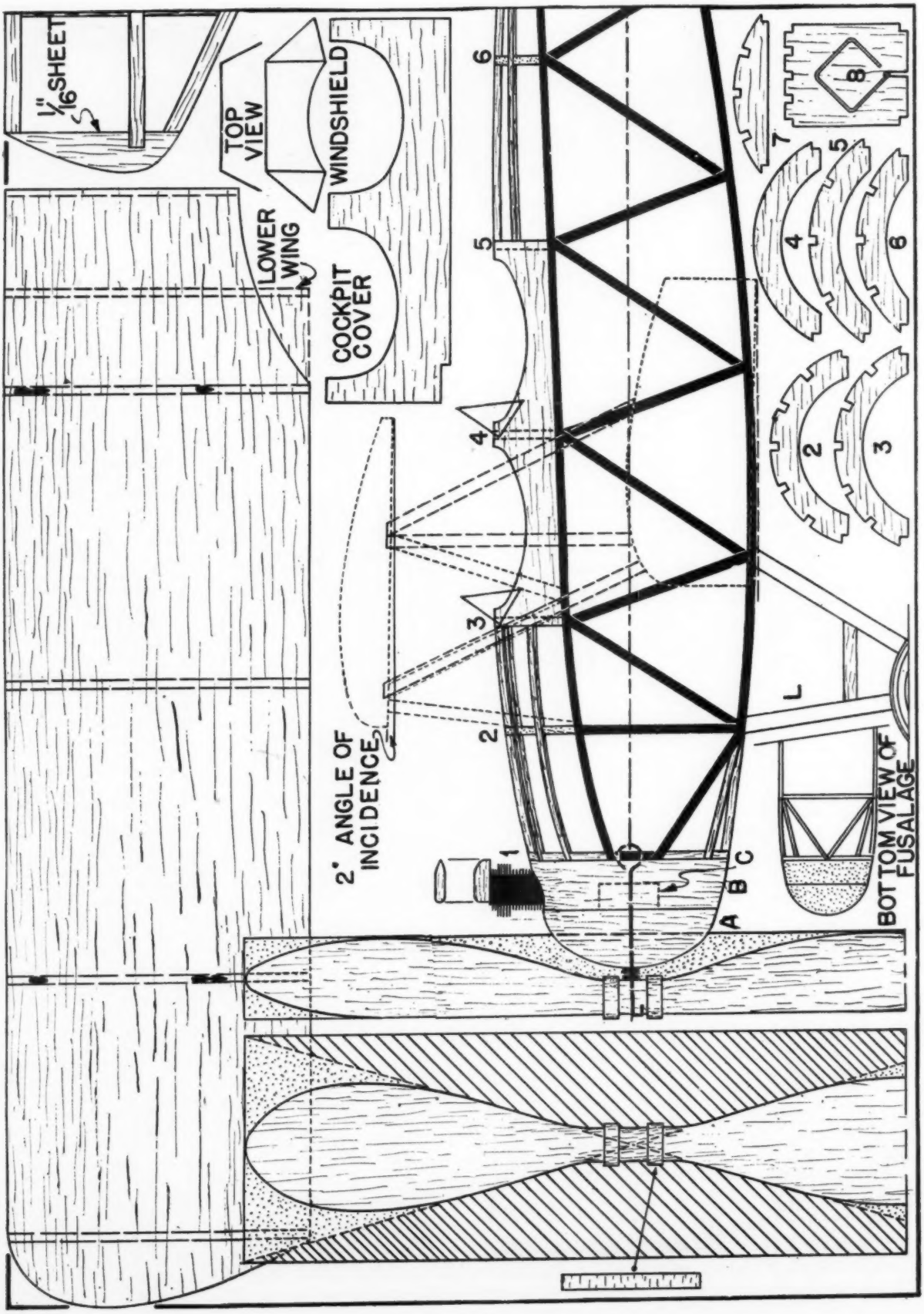
In the landing gear, the V.25 boasted extra side struts instead of wires for bracing. The axle wing was retained for sake of streamline as in previous models.

Thirty-two ribs mounted on two box spars made up the main skeleton of the one-piece cantilever wing. The leading edge was of molded wood, the

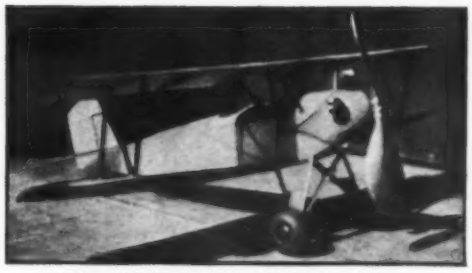
(Continued on page 43)



The Junkers D.I, a metal single-seater fighter, developed from the J.7


1/16" SHEET
TOP VIEW
WINDSHIELD
LOWER WING
COCKPIT COVER
2° ANGLE OF INCIDENCE
BOTTOM VIEW OF FUSALAGE
A
B
C
1
2
3
4
5
6
7
8
L

A Flying Model of the Consolidated Fleet Trainer



Though simply made, it is a fine flier

How You Can Build a Simple Balsa Wing Flying Scale Model of a Famous Training Plane That Has Unusual Flying Qualities

By ELMER PILZER

FOR flying instruction, for sport and for business use, the "Fleet" has proved its worth as an airplane of outstanding merit. It has been the standard training plane of the United States Army and Navy for the past five years, and used as well by foreign countries. Its light steel construction is so strong as to stand the strain of being outside looped, a feat which very few airplanes have successfully accomplished. The "Fleet" is powered with a 100 hp. Kinner K-5 engine, which pulls it at a top speed of 100 m.p.h., and has the low landing speed of 46 m.p.h. There are many other good features about this plane which are too numerous to mention.

Build and fly this model of one of the safest and easiest of airplanes to handle, and you will find that, like its big brother, it has excellent stability.

Fuselage

Unless specified, medium-hard balsa is used throughout entire model. Trace and cut out all the formers of 1/16" sheet balsa. Join plans and place a sheet of transparent waxpaper over them. Make one side of the fuselage (shown on drawing by heavy black lines) of 1/16" sq. balsa. Then make the other side directly on top of the first. When the sides are thoroughly dry, take them off the plan and cut them apart carefully. Form the wire rear hook and cement it to Former 8. Cement Former 8 and 1 into place onto the fuselage sides. Continue by cementing in position the remaining formers and the 1/16" sq. balsa cross members for the bottom of the body. Now cement the rear end of the sides together. The stringers and tail skid should now be cemented in place. One half of the cockpit cover is shown, so trace it on a sheet of 1/32" balsa and then turn it over and trace the other half. Now cut it out and cement it on the fuselage. Finally cut out two windshields of thin celluloid and cement them in place.

Air wheels and dummy engine make it very realistic in appearance. The large propeller insures long flights

Nose Block and Cylinders

Trace and cut the front view of block B on a piece of medium soft balsa ⅜"x1½"x1¼". Also mark off the five points for the cylinders. Lightly cement a piece of medium-soft balsa ½"x1½"x 1½" onto block B and cut it down into shape according to plan. When sanded,

The model in full flight

pry apart block A from block B. Now cut out piece C and cement it in place on block A. This simple arrangement permits you to replace the rubber strands without trouble. Although the cylinders are very simple to build, they require a great deal of patience. A piece of ¼" sq. soft balsa is rounded off into a pencil-like shape. Then thin discs of 1/64" pieces are cut off the end. Now with the aid of a compass, draw a number of small and larger circles (shown on plan as X and Y) on very thin cardboard and cut them out with scissors. By cementing together a disc of balsa, then a disc of paper, alternately, you will produce the flanges and shape of a cylinder. Finally cut off one end of the cylinder to fit the shape of block B and cement all five into place. You may now cut out 10 small rocker heads and cement them in place on top of the cylinder.

Landing Gear and Propeller

Cut and streamline all the struts for the landing gear. Bamboo struts L and R are cemented together and allowed to dry. Struts S and T should be given two coats of cement to strengthen them. Form the wire axle and bend one end into a zigzag shape so as not to twist out of line on a heavy landing. Cement the axles into place and wind thread around them. Now assemble the landing gear, using cement sparingly on all joints. A pair 1¼" celluloid or balsa wheels may now be put on axles. Balloon tire wheels make the neatest appearance.

For the prop, select a block of balsa ⅝"x1¾"x6" and draw diagonals from corner to corner (shown on plan by dashed lines) and cut out that shape, cutting away all the lined section. Force a needle through the hub for the prop shaft. Now cut out the twist of the blades, giving the rear of the prop a slight concave. Then cut out the shape of the blades by cutting away all the dotted section. Round the hub and cut out the true shape of a prop blade. You may now cement on the two small pieces around the hub. Of course, the prop must be balanced. Finally form the wire prop shaft, put it through the nose block, add washers, then through the prop and bend it back into the hub, and cement heavily.

Tail and Wings

Leading and trailing edges and center spars of the tails are of 1/6"x⅛" balsa and ribs of 1/16" sq. Both tails should be left to dry overnight on jig so as to keep a flat surface. Cover the fuselage and tails with tissue and banana oil and cement them in place together.

Trace and cut out the ribs of 1/16" sheet balsa. Two pieces of 1/32" sheet balsa for the top wing, and two pieces for the bottom wing are also traced and cut. Mark off the places for the ribs; pin and cement them in place using small model pins. When ribs are dry, remove the pins and cement the halves of the top wing together giving both ends a dihedral of ⅜".

While this is drying, cut and streamline all the struts. By forcing tiny splinters of bamboo into the ends of the struts, you will find it much easier to assemble the wings. Cement on the center section struts and top wing first and then the lower wing and outer bay struts. It would be wise to cement thread all around the edges of the wings to prevent the wood from denting and splitting.

The model is powered with either two

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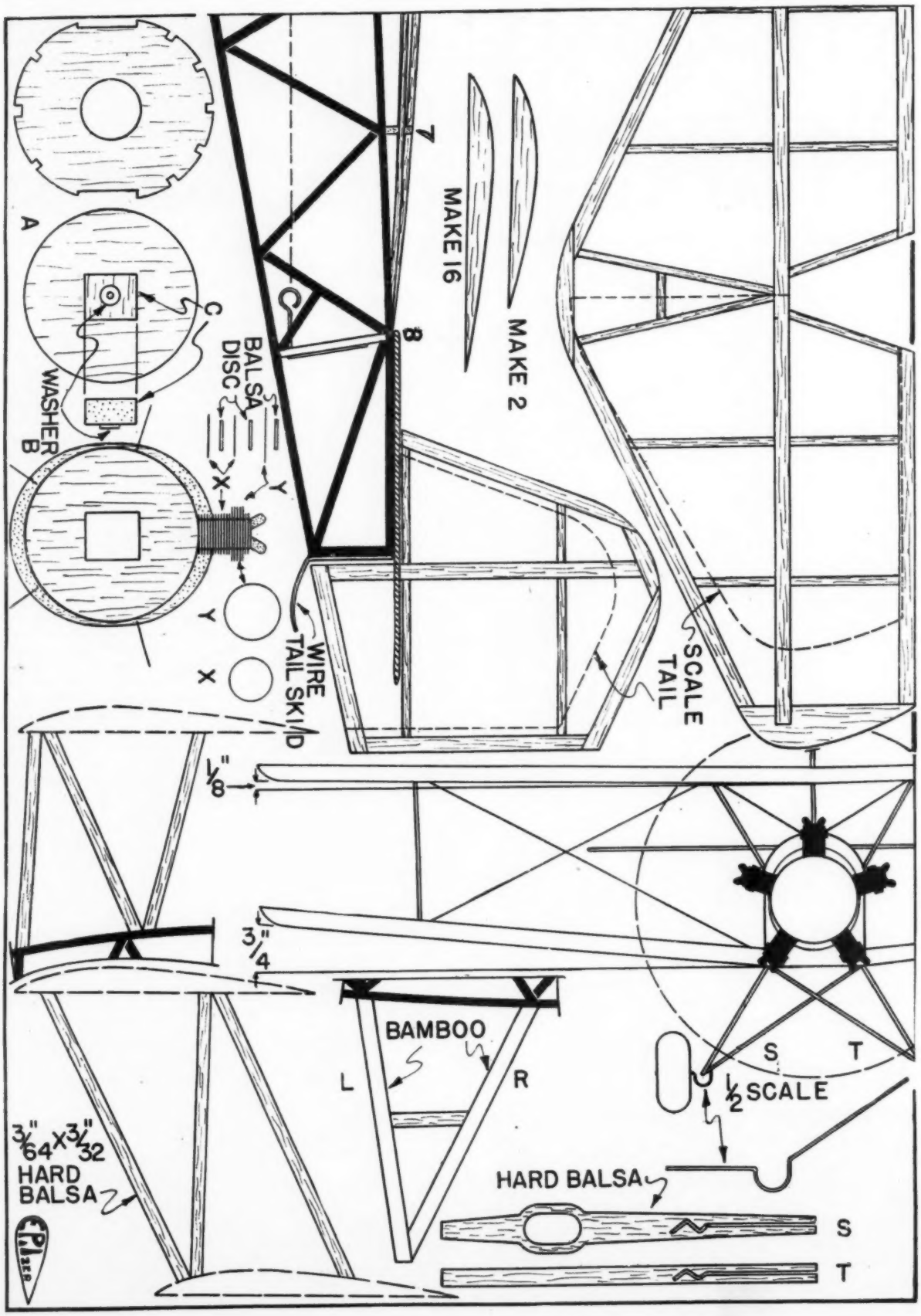
A
C
WASHER B
BALSA DISC
X
Y
Y
X
MAKE 16
MAKE 2
7
8
WIRE TAIL SKID
SCALE TAIL
1/8"
3/4"
BAMBOO
L
R
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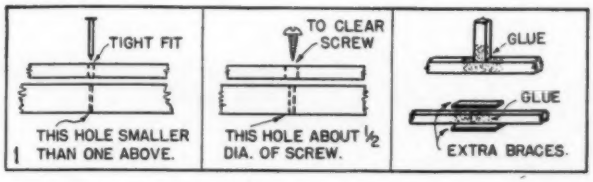
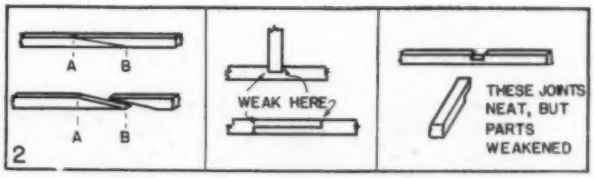
T
1/2 SCALE
HARD BALSA
S
T
3/64"X3/32"
HARD BALSA





Secrets of Good Model Building

A Veteran Model Plane Builder Herein Gives You Construction Hints That Will Help You to Build Strong and Lighter Models

By HOWARD G. McENTEE

PART 1

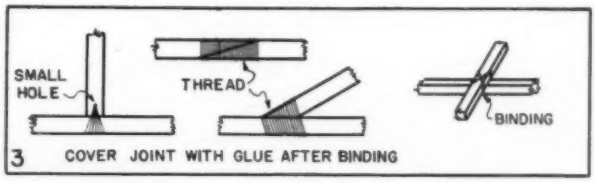
MOST articles on model airplane construction are of necessity, rather broad and abbreviated, which makes it very difficult for the beginner in this fascinating hobby to do justice to a model. There are always many points about which he is in doubt and the model probably suffers thereby. Even the most detailed articles are not sufficient, for it would take a good-sized book and a hundred or more illustrations to completely describe every step in the construction so there would be no possible doubt left on any point.

The purpose of this article, then, is to describe some of the most elementary points of model construction, and it is hoped that the beginner, after reading the detailed points to be given, will be able to take the average, well-written model-building article, and construct a fair reproduction of the original, not having to stop many times during the building to puzzle out points that the author was forced to omit.

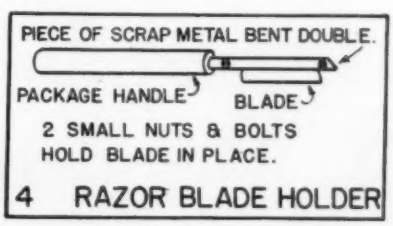
Since wood is the basis for most model work, we shall consider its use first. The simplest form of woodwork use is that of joining two pieces together. Since nails are seldom used in this age of balsa, or to be more exact, seldom used in the United States, we shall not give very much space to them. Nails, of course, are used only with the heavier woods such as pine or spruce, since balsa is too soft to hold them in place securely. Tiny holes should always be drilled in the wood before putting the nail in place. Sketch No. 1 shows in an exaggerated way how this is done, the holes, of course, being made to prevent splitting the thin strips. In any case where nails are used, the joint should be smeared with glue before assembly, the excess being wiped off after the nail is driven.

Tiny screws are also used at times, particularly in the larger models such as the compressed air and gasoline types. (See Figure 2.) Small holes are drilled in this case also but glue is not always used. Quite often screws are used so that some part, such as a wing strut, may be readily removed.

When using balsa wood, the strength of the glue alone is sufficient to hold the pieces firmly together. Sometimes thread is used to bind the pieces more firmly. The thread also serves to hold the pieces tightly together while the glue is drying, and, of course, the joint is greatly strengthened by its use. Figure 3a shows a so-called butt joint. This type is not very strong, but can be used in many cases, especially if glue is well spread over the joint as shown. The glue makes an effective "case" around the joint and adds much to the strength. Figure 3b shows a butt joint of two strips in line. This is rather poor practice, however, and the lap joint shown at Figure 4 is much better. The distance A-B should be not less than twice the width of the strip, and three times is not too much. If type 3b joint is considered necessary and is apt to be bent at all, it should be strengthened with a strip on either side as shown by the dotted lines. The butt joints of type 3a are used mostly in fuselage construction. In this case the covering of the completed model keeps the structure rigid and prevents any twisting motion which would surely loosen the joint.



Joints shown in Figure 5 are not recommended for use with balsa. While they may make the joint firmer, the wood is weakened and is apt to crack. Where extra strength is needed, thread is employed as shown in Figure 6, and the whole joint thinly coated with glue, the result being a joint considerably stronger than the wood itself. These thread-strengthened joints should always be used when working with pine or spruce or other such types of wood.



While we are on the subject of joints, a short discussion of the glue is in order. The only glue suitable for model use is that which is soluble in acetone and dries to a celluloid-like skin. Ambroid and Duco Cement are examples of this type. These glues are completely waterproof and dry very quickly. They are quite flexible when dry and, therefore, will stand considerable rough handling. The transparent types are much preferred for model use as they enable the builder to make a much cleaner-looking model. It should be mentioned here that the wood or other material to be fastened with such adhesives must be quite dry since they cannot "take" properly on a damp surface.

The only water-soluble glue that is fitted for model work is that called Casco and this is not recommended. It is made of skim milk and comes as a white powder which is mixed with water and must be used within several hours after it has been mixed. Once it dries it cannot be softened again as a chemical change takes place. This glue is waterproof when dry and it possesses great strength, for which reason it is widely used in the construction of man-carrying airplanes.

The writer has found the glue which comes in collapsible tubes the most satisfactory for model work. A six-inch length of No. 12 or No. 14 copper wire is used as a combined stopper and spreader. When the glue is used from jars or cans, it invariably dries out and thickens too quickly. Acetone, which is a solvent procurable at any druggist, is suitable for thinning out the glue. The tube is easiest to use, however, since the glue can be applied directly to the work without any chance of spilling or other bother. In any case, whether tube or other type of container is used, it should be kept closed when not actually in use. With the tube, the small area exposed to the air makes this less imperative, but it should be followed nevertheless.

Doubtless, all model builders, from the rank beginner on, know that razor blades are used extensively for cutting work of all sorts in model airplane construction. There is no problem of what to do with old razor blades in a home which houses a model builder. In fact, the blades are apt to disappear before they become very old! All types are suitable for model use,

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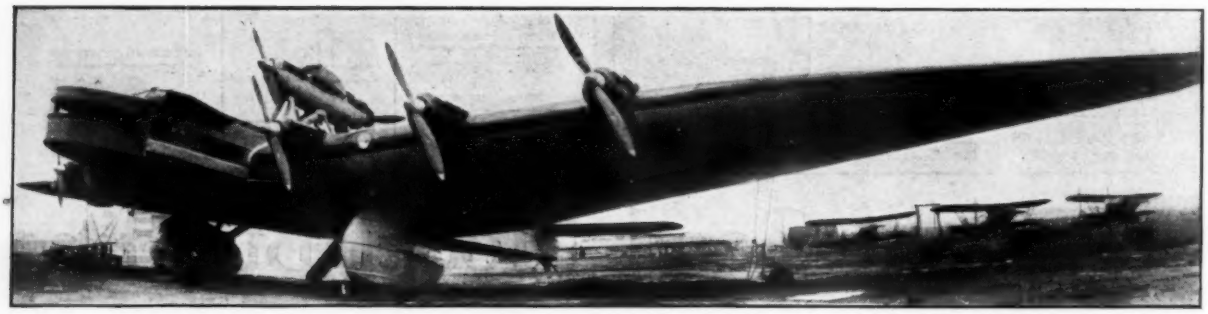


The Russian giant 70-passenger plane the Maxim Gorky, that crashed recently. Ten are being built

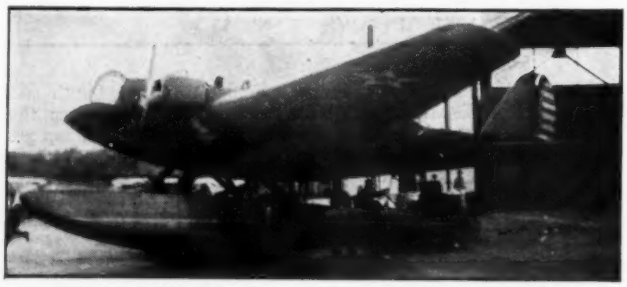
On the Frontiers of Aviation

Interesting Facts About the Latest Airplanes That Are Placing America First in Aviation Development

By ROBERT C. MORRISON

WITH the passing of each month Aviation takes a great step forward. New airplanes are constantly being produced with performances that greatly outstrip their predecessors of only a short time ago. More so is this fact true in the United States than in any other country. Without a doubt American aircraft leads in every phase of aviation to which an airplane may be put to practical use!

Last month we published plans and performance on the new Fairchild amphibian and now we have gathered additional information on the wonderful little ship that should be of much interest. Besides having retractable wing floats, the amphibian will also have a landing gear which folds neatly up into the wing. The tail wheel also rises into a compartment in the rear of the hull. These features greatly add to the efficiency of the plane with the result of its very high speed. A single motor controls landing gear, wing flaps and wing floats. Besides the Pratt & Whitney Hornet, a Wright Cyclone of 670 hp. may also be used. The plane, of which six are now on order for Pan-American Airways, has a cruising range of 750 miles.



The Martin Bomber goes to sea. Floats have been added

The famous Sikorsky Aircraft Corporation is now endeavoring to obtain a Navy contract for some of its S-42s. The giant four-engined flying boats will have to be slightly revamped to conform with Navy specifications. Undoubtedly only one rudder will be employed on the ship so as to allow better vision in the tail for the gunner. The S-43s would also make wonderful patrol boats. Sikorsky is also definitely at work on a new six-engined transport. It should be able to fly non-stop across the Atlantic with a huge load of mail and passengers!

Word comes to us that the Consolidated Aircraft Corporation may build a new transport flying boat for service in Japan. It will be somewhat similar to the old Commodores and latest Navy Consolidated patrol boats that are now in service.

The Stinson Company is also the producer of a new airplane. It is a low-wing cabin sport plane that should prove very popular.

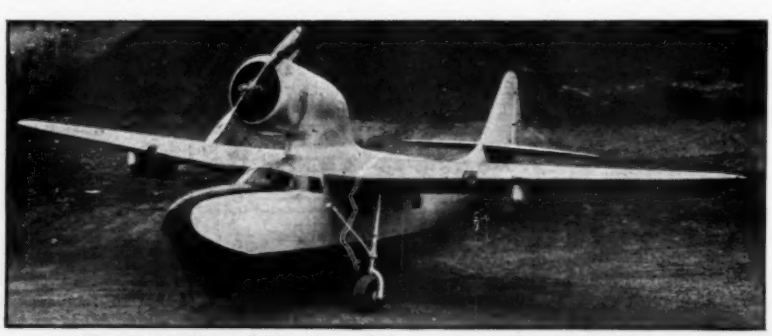
Stearman has a revamped version of their Navy trainer on the market waiting for a contract from the U.S. Army Air Corps.

Great Lakes have out a new two-place cabin biplane powered by a Warner Super Scarab. It would be a fine little ship for the sportsman.

Still more information has come to light on the Curtiss observation planes recently ordered for the Navy in large quantity. The planes will be modernized versions of the Curtiss Hawk and will seat two persons instead of one. Among its high performance qualities is a long cruising range. Perhaps the planes are of the XO3C-1 type or a development of it. The XO3C-1 is a Curtiss two-place observation biplane amphibian with slots and flaps in the upper wings. The wheels retract into a stainless steel pontoon which rests underneath the fuselage. The first of the new planes is expected to be delivered early in July.

The St. Louis Aircraft Corporation has been working on some new planes for the Army and Navy. In the past the company has been specializing in manufacturing special parts for Army and Navy aircraft and has just recently entered into the manufacture of airplanes.

Among Navy purchasers is a Fairchild scout-observation XSOK-1 powered by a Wright engine. The ship is to undergo tests by the Navy. The Fairchild Company also has an advanced type of the Weike N.A.C.A. plane under construction. The ship has "foolproof" flying qualities and has been expressly designed for the private flier.



The Fairchild Amphibian, one of the most graceful ships of its type

It has now been announced officially that the Bureau of Air Commerce has ordered one of the

Believe it or not, this is an actual photograph of a man sitting in a burning airplane without any discomfort. He is wearing an asbestos suit

The first international glider-train glider lands in the streets of Havana

new Pitcairn autogiros. The ship will be radically different from former autogiros. The accompanying photograph illustrates the unique features of the ship. The machine will incorporate a road drive mechanism in order that it may be driven on roads when the propeller is disconnected. The rotating blades may be folded quickly so that the ship may be driven as a motor car and may be housed in a space about seven by twenty-four feet.

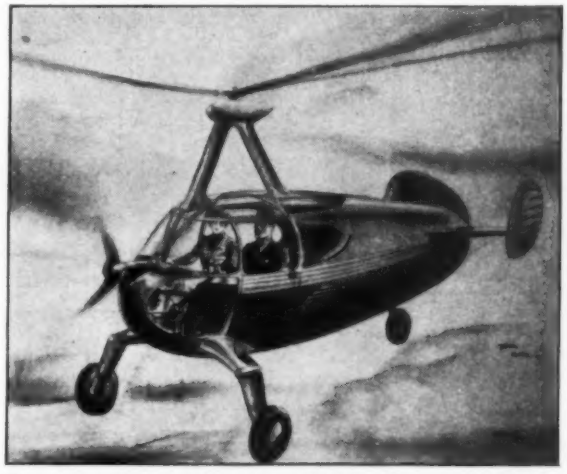
Approximate performance figure and specifications of the proposed plane follow:

Gross weight	1350 pounds
Overall length	24 feet
Overall height	8 feet
Overall width	7 feet
Tread	64 inches
Wheel base	114 inches
Tire size	7.00 by 5.00 (17½ inch dia.)
Max. speed on land	20-25 m.p.h.
Max. speed in air	115 m.p.h.
Engine	Pobjoy geared radial
No. cylinders	7
Bore and stroke	77 by 87 mm.
Horsepower	90 at 3500 (engine speed)
Diameter rotor blades	34½ feet

Mr. Walter P. Inman, wealthy sportsman of Somerville, N.J., has purchased a Lockheed Electra for his private use and keeps it at Hadley Field, N.J. The ship has a comfortable cabin which provides four reclining chairs, a lounge, folding table and filing and map cabinets. Flight equipment includes a Sperry automatic pilot and complete two-way radio. Ken Unger, noted war pilot, will act as pilot of the plane.

In England a new De Havilland Comet is expected to be built with clipped wings and to have a high speed of 290 m.p.h. and cruise at 265 m.p.h. Two engines of 275 hp. each will be used on the ship.

The one and only DC-1 that Douglas ever built which was recently flown across the continent in record time by D. W. (Tommy) Tomlinson of National Air Race fame is to be revamped for stratosphere flying such as that done by Wiley Post. If so equipped the DC-1 should have a cruising speed of 225 m.p.h. at about 25,000 feet and 275 m.p.h. at 50,000 feet! Post flew his old Lockheed at a height of about 35,000 feet. The stratosphere begins at about 38,000 feet. The ship was flown over a triangular course and brought back to the United States numerous records for speed and altitude flights with load such as the S42s did not so long ago in the seaplane class.



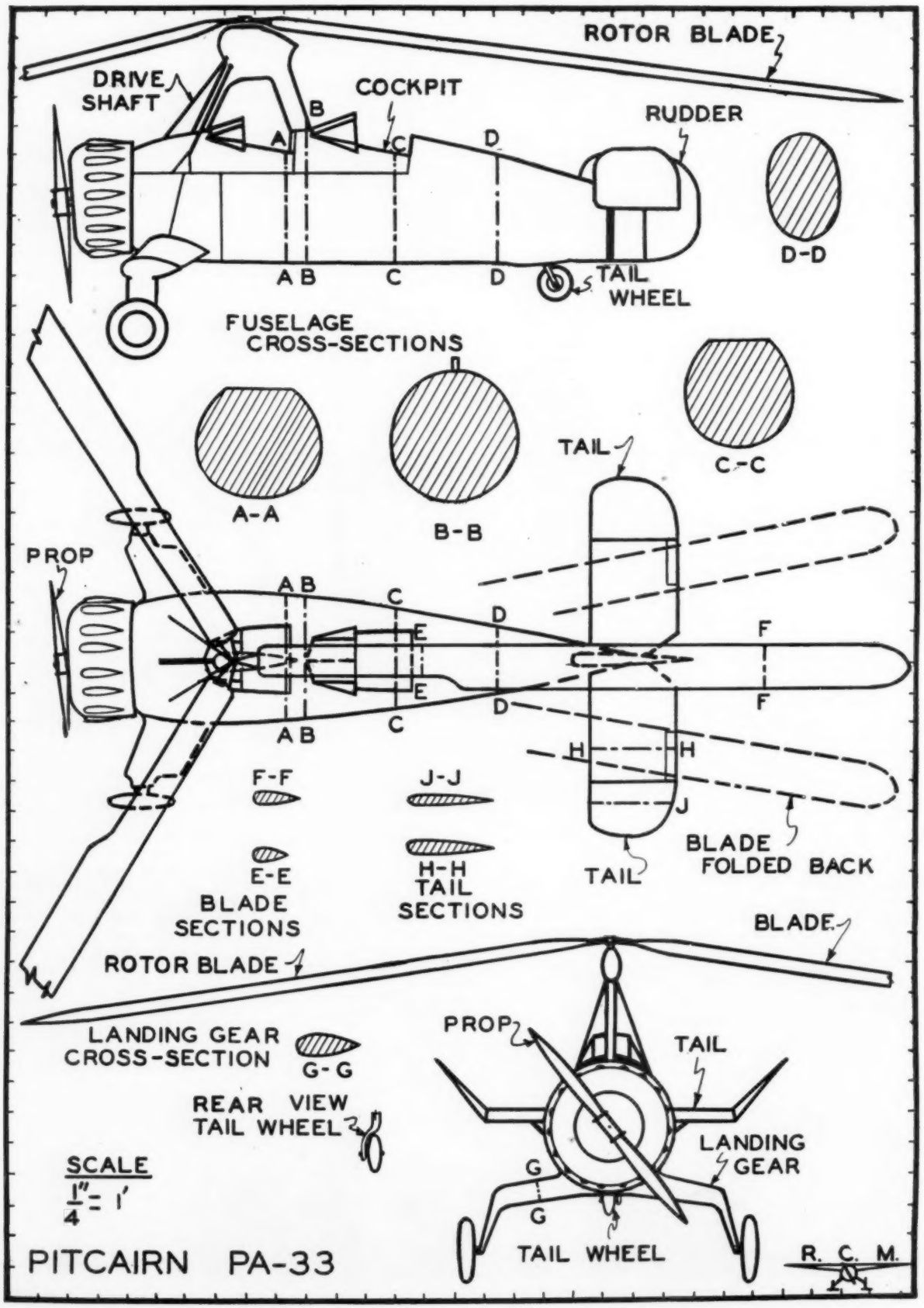
How the new Pitcairn Autogiro will look. The rotor vanes fold back so it can be garaged easily. (Drawing by Josef Kotula)

Douglas Aircraft is already figuring on a new transport to surpass the present one. It will of course be known as the DC-3. The cabin of the proposed plane will be much wider than the DC-2 and will seat 24 passengers as a day plane and 16 passengers as a sleeper. The entire dimensions of the ship will be much greater than the DC-2, thus increasing pay load and range. About the time the plane is completed, approximately a year and a half from the present, new engines of 900-1,000 horsepower will have been built to be used in the huge airliner. By that time engines should be developed to have a smaller fuel consumption per horsepower than our present engines. This would increase the DC-3's range further than would be possible at the present time. Automatic controllable pitch props and mixture control will be other new features of the plane. Under present plans it has been understood by us that the DC-3 will not be a stratosphere plane. Its successor will undoubtedly be of the high altitude type. Prices on the Douglas transports range from $58,000 to $86,000 each, and it is expected that the Douglas Company will sell in the neighborhood of 200 before competition forces them to put out something better. A profit on the total number will be about $1,000,000!

To those connected with aviation and those who expect to make some phase of aeronautics their profession, the following news will be of great importance. In England the government is considering the transportation of all first-class mail by air! If negotiations are successful there will undoubtedly be a "merry scramble" by all other countries to do likewise. The United States is now in a better position to carry all domestic first-class mail by air than almost any other country of its size. One can readily see the expansion that would take place in American aviation! Our airlines are well organized, our airports are in good condition and excellently equipped, and our air transports are swift

(Continued on page 42)

Here is the latest 120 m.p.h. Autogiro purchased by the U.S. Army


ROTOR BLADE
DRIVE SHAFT
COCKPIT
RUDDER
A
B
C
D
A B
C
D
TAIL WHEEL
D-D
FUSELAGE CROSS-SECTIONS
A-A
B-B
C-C
TAIL
PROP
A B
C
D
E
E
F
F
D
A B
C
H
H
J
F-F
J-J
E-E
BLADE SECTIONS
H-H TAIL SECTIONS
TAIL
BLADE FOLDED BACK
BLADE
ROTOR BLADE
LANDING GEAR CROSS-SECTION
G-G
REAR VIEW TAIL WHEEL
PROP
TAIL
LANDING GEAR
G
G
TAIL WHEEL
SCALE
1" / 4 = 1'
PITCAIRN PA-33
R. C. M.

Airplane Observers Contest Winners

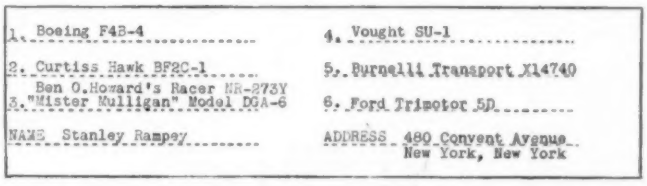
Here Are the Winners and Correct Answers to Contest No. 1

THE biggest contest that MODEL AIRPLANE NEWS has ever held, the Airplane Observers Contest—Part No. 1, has just come to a close. Over three thousand boys all over the United States and from various foreign countries sent in their answers. Our staff of judges was kept busy assorting the entries.

Most of the names of the pictures were given. These names were to be put under the picture corresponding with it. One picture was without a name. The contestants were supposed to have given the correct name of this machine together with the model number. Apparently this was a very easy thing to do. However, the model number of this machine was not well known and only a few were able to give it correctly.

At the top of the page you will see the correct answers for the various machines. This is a reduced exact reproduction of the winning entry, which was submitted by Stanley Rampey. We take great pleasure in listing the winners here. They are as follows:

1. Stanley Rampey, 480 Convent Avenue, New York City.
2. David Keller, 3706 Georgia Street, San Diego, Calif.
3. John Mackenzie, 3061 West 101st Street, Cleveland, Ohio.
4. Jarden McCorkle, Gladwyne, Pa.
5. Jack Canary, 851 North Linden Avenue, Oak Park, Ill.
6. Thomas B. Metzger, Jr., 2122 East 4th Street, Cleveland, Ohio.
7. Warren D. Shipp, 565 Fort Washington Avenue, New York City.
8. Donald McCash, 1040 Ramona Street, Palo Alto, Calif.


1. Boeing F4B-4
2. Curtiss Hawk BF2C-1
3. Ben O.Howard's Racer NR-273Y "Mister Mulligan" Model DGA-6
4. Vought SU-1
5. Burnelli Transport X14740
6. Ford Trimotor 5D
NAME Stanley Rampey
ADDRESS 480 Convent Avenue New York, New York

This is a reproduction of Stanley Rampey's winning entry. Note the answer to picture No. 3

1st place winner, Stanley Rampey

2nd place winner, David Keller

9. Bill Metzger, 1547 Mars Avenue, Lakewood, Ohio.
10. Marvin Yeager, 150 Westgate Avenue, Columbus, Ohio.
11. Reid Patterson, 325 East 7th Street, Charlotte, N.C.
12. Charles W. Tonkin, P.O. Box 694, Waynesboro, Virginia.
13. Dick Zurlinden, 1312 Sloan Avenue, Lakewood, Ohio.
14. Gordon Sear Williams, 5740 36 Avenue, N.E., Seattle, Wash.
15. Edmund A. Lorence, 26 East Sumner Avenue, Roselle Park, New Jersey.
16. Steve Kovach, 2406 Bridge Avenue, Cleveland, Ohio.
17. Bob Bertram, 1 Concordia College East, Fort Wayne, Ind.
18. Edward Cowles, 76 Robert Avenue, Port Chester, New York.

These young men deserve a lot of credit for their persistence, accuracy and neatness. Each one of them is an ardent airplane fan and knows his planes. Pictures of most of the winners appear on this page. We regret exceedingly that a number of the winners were unable to send their photographs and thus we have been unable to reproduce them.

Take a look at these young men carefully. Without question, you will see their faces and hear their names mentioned many times in connection with aviation in the years to come. You will probably be interested to read a few points of interest about some of these young men.

Mr. Rampey is a chauffeur, 22 years of age and at present is employed by a printer, which fact may account for his ability to

(Continued on page 41)

4th place winner, Jarden McCorkle

5th place winner, Jack Canary

7th place winner, Warren D. Shipp

9th place winner, Bill Metzger

10th place winner, Marvin Yeager

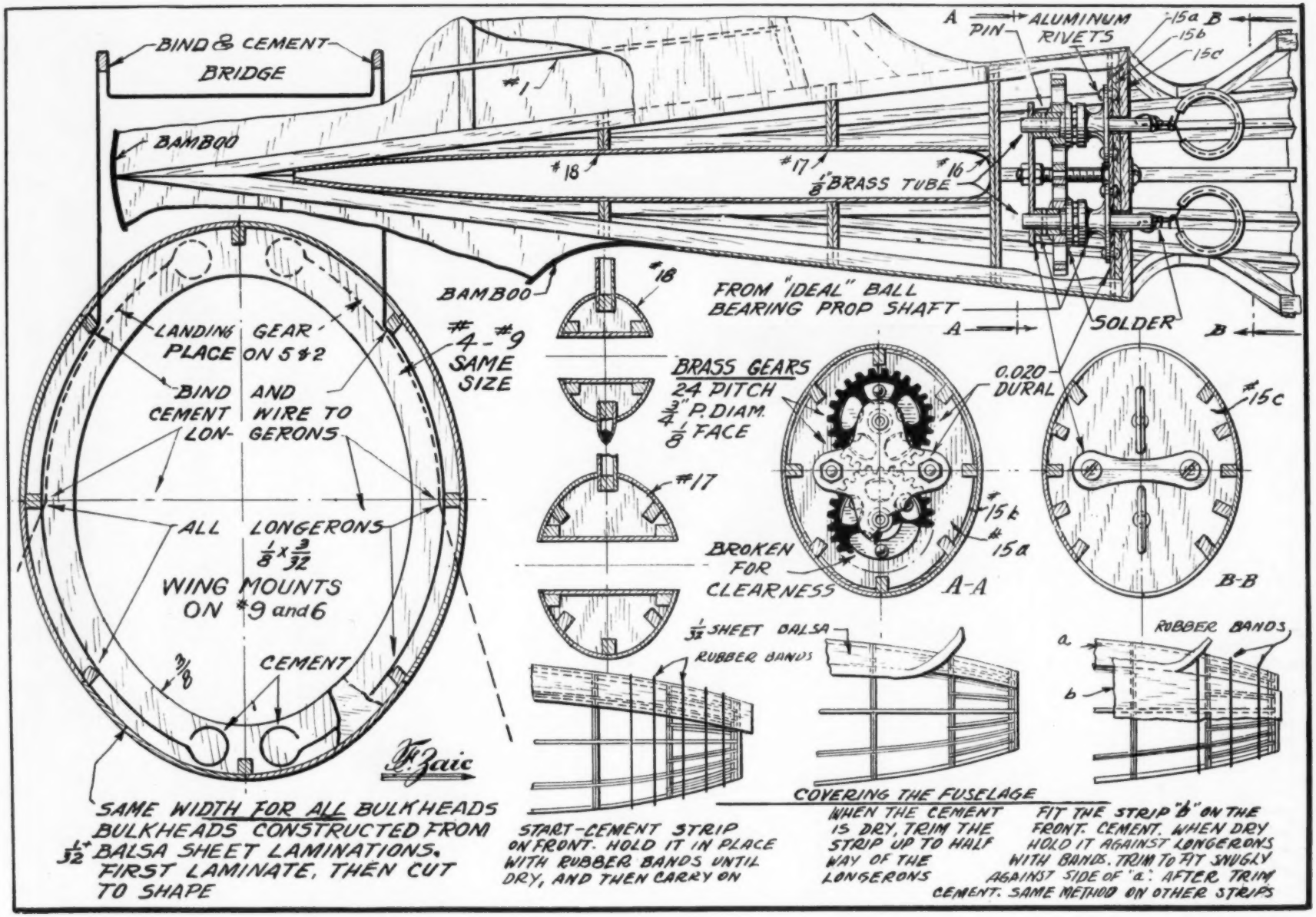
11th place winner, Reid Patterson

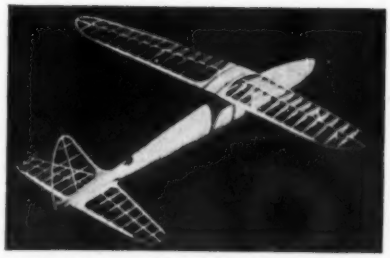
12th place winner, Charles W. Tonkin

15th place winner, Edmund Lorence

16th place winner, Steve Kovach

18th place winner, Edward Cowles


BIND & CEMENT BRIDGE
BAMBOO
#1
#18
#17
#16
1/8" BRASS TUBE
A
PIN
ALUMINUM RIVETS
15a
B
15b
15c
BAMBOO
FROM "IDEAL" BALL BEARING PROP SHAFT
A
SOLDER
B
LANDING GEAR PLACE ON 5 & 2
BIND CEMENT AND WIRE TO LONGERONS
#4 - #9 SAME SIZE
#18
BRASS GEARS 24 PITCH 3/4" P. DIAM. 1/8 FACE
0.020 DURAL
#15c
#17
#15b
#15a
BROKEN FOR CLEARNESS
A-A
B-B
ALL LONGERONS 1/8 x 3/32
WING MOUNTS ON #9 and 6
3/8
CEMENT
1/32 SHEET BALSA
RUBBER BANDS
RUBBER BANDS
a
b
F. Zaic
SAME WIDTH FOR ALL BULKHEADS
BULKHEADS CONSTRUCTED FROM 1/32" BALSA SHEET LAMINATIONS. FIRST LAMINATE, THEN CUT TO SHAPE
START-CEMENT STRIP ON FRONT. HOLD IT IN PLACE WITH RUBBER BANDS UNTIL DRY, AND THEN CARRY ON
COVERING THE FUSELAGE
WHEN THE CEMENT IS DRY, TRIM THE STRIP UP TO HALF WAY OF THE LONGERONS
FIT THE STRIP "b" ON THE FRONT. CEMENT. WHEN DRY HOLD IT AGAINST LONGERONS WITH BANDS. TRIM TO FIT SNUGLY AGAINST SIDE OF "a". AFTER TRIM CEMENT. SAME METHOD ON OTHER STRIPS



The highest efficiency is obtained by the shape and carefully streamlined design of the entire structure

An American "Wakefield" Entry

A finer soarer, stable and efficient

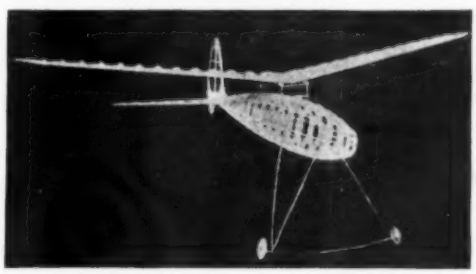
How You Can Build One of the Most Advanced Types of Fuselage Racing Models Which Placed Among the Winners in the 1934 Wakefield International Contest

By FRANK ZAIC

"A STEADY drizzle of rain was falling, and the clouds were very low at Warwick race course—the wind was rather patchy and troublesome. In spite of this some very good flights were made. The American machines flew beautifully, noticeable features being their extremely slow speed air screws and beautiful landings due to their slow gliding properties.

"The most promising American machine (W. Getsla), was unfortunately rendered *hors de combat*, due to its air screw spindle pulling out, the sudden release of tension wrecking part of the fuselage. Its first flight was one of 116 seconds. Another American machine (F. Zaic), which flew very steadily was a parasol with fuselage constructed entirely of balsa wood.

"The lucky winner was Mr. J. B. Allman, of Warwick Club, with an average of three flights of 111.8 seconds. The weight of his machine was 5½ ounces." *(An excerpt from "Flight," June 28, 1934.)*



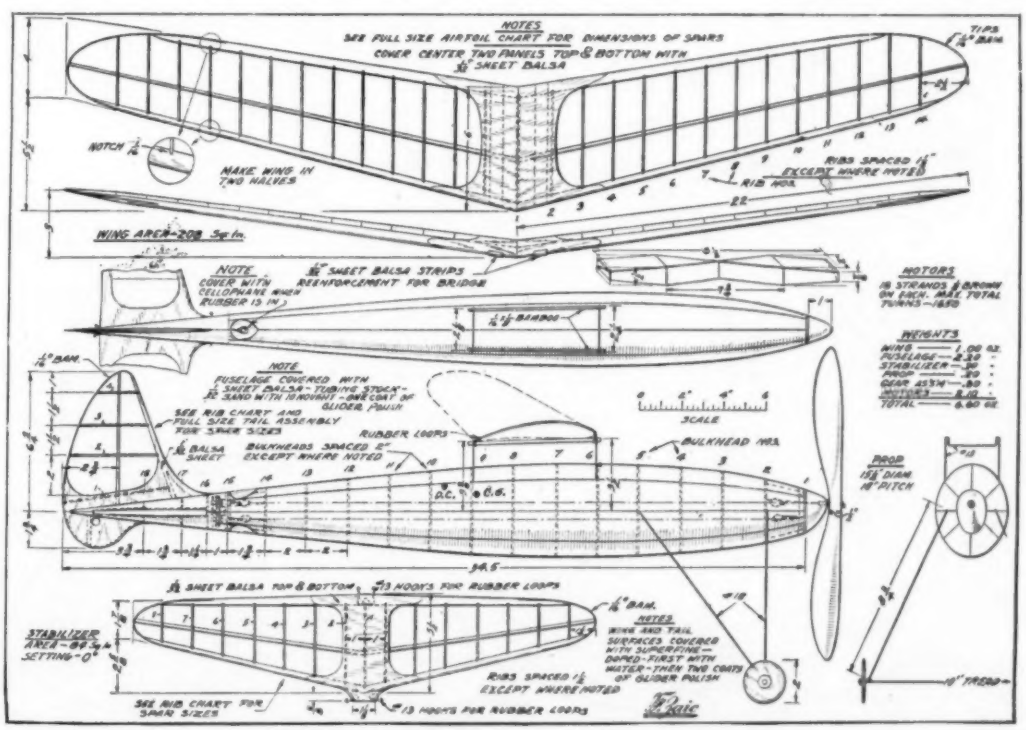
The completed framework before covering

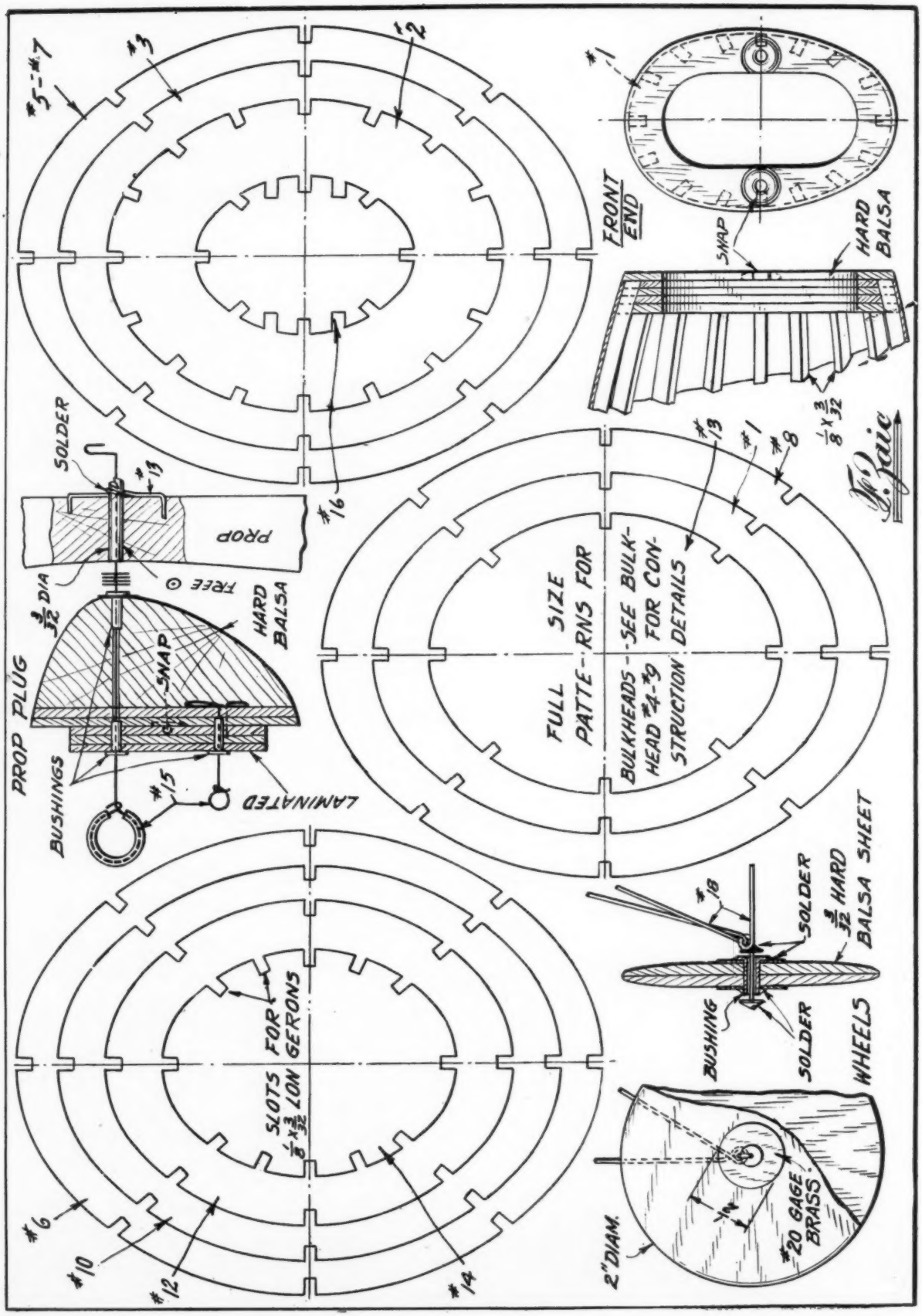
Now that we know what the 1934 Wakefield Competition was like, let us see what one of the American entries looked like.

This particular model was designed and constructed in two weeks after a belated decision to enter the contest. It flew perfectly on its first test flight. Not wanting to tempt the thermals too much, the model was packed and sent to England through the courtesy of the Bamberger Aero Club.

The contest rules call for an average time of three flights. That brings us to the fact that the model must cruise within the vicinity of the judges for as long a time as possible. Therefore, the requirements are: A low ceiling ship and a long prop duration. By using special gear arrangement, the writer obtained a guaranteed prop turn of over 3 minutes, and the extra weight of the gears and the motors made the model automatically a low ceiling flyer. To conserve the power for as long a time as possible, streamlining was resorted to. And with streamlining, the elliptical balsa-covered fuselage went hand in hand. As the drawings show the constructional features pretty well, the writer

(Continued on page 38)


NOTES
SEE FULL SIZE AIRFOIL CHART FOR DIMENSIONS OF SPARS
COVER CENTER TWO PANELS TOP & BOTTOM WITH
1/32" SHEET BALSA
TIPS
1/4" BAM.
NOTCH 1/16
MAKE WING IN TWO HALVES
RIBS SPACED 1/4" EXCEPT WHERE NOTED
RIB NOS.
WING AREA-208 Sq. in.
NOTE
COVER WITH CELLOPHANE WHEN RUBBER IS IN
1/32" SHEET BALSA STRIPS REINFORCEMENT FOR BRIDGE
1/4" BAMBOO
MOTORS
10 STRANDS 1/4" BROWN ON EACH. MAX. TOTAL TURNS-1650
WEIGHTS
WING ---- 1.00 OZ.
FUSELAGE ---- 2.30 "
STABILIZER ---- .90 "
PROP ---- .70 "
GEAR 45 3/4" ---- .80 "
MOTORS ---- 5.10 "
TOTAL ---- 6.00 OZ.
1/4" BAM.
NOTE
FUSELAGE COVERED WITH 1/32 SHEET BALSA-TURNING STOCK-1/2 SAND WITH SEASONIT-ONE COAT OF GLIDER POLISH
SEE RIB CHART AND FULL SIZE TAIL ASSEMBLY FOR SPAR SIZES
1/16 BALSA SHEET
BULKHEADS SPACED 2" EXCEPT WHERE NOTED
RUBBER LOOPS
BULKHEAD NOS.
SCALE
C.G.
C.L.
PROP 15" DIAM. 18" PITCH
1/4" SHEET BALSA TOP & BOTTOM
#13 HOOKS FOR RUBBER LOOPS
1/4" BAM.
STABILIZER AREA-84 3/4 SETTING-0°
NOTES
WING AND TAIL SURFACES COVERED WITH SUPERCUB-DOPED-FIRST WITH WATER-THEN TWO COATS OF GLIDER POLISH
RIBS SPACED 1/2 EXCEPT WHERE NOTED
SEE RIB CHART FOR SPAR SIZES
#13 HOOKS FOR RUBBER LOOPS
10" TREAD
F. Zaic


#5-#7
#3
#2
#16
#1
FRONT END
SWAP
HARD BALSA
1/8 X 3/32
SOLDER
#13
PROP
FREE
3/32 DIA
HARD BALSA
PROP PLUG
SNAP
BUSHINGS
#15
LAMINATED
FULL SIZE PATTERNS FOR BULKHEADS - SEE BULKHEAD #4-#9 FOR CONSTRUCTION DETAILS
#13
#1
#8
#18
SOLDER
3/32 HARD BALSA SHEET
BUSHING
SOLDER
WHEELS
2" DIAM.
#20 GAGE BRASS
SLOTS FOR 1/8 X 3/32 LONGERONS
#6
#10
#12
#14

MAKE ALL RIBS FROM 1/16 SHEET BALSA
M-1
R.A.F. 32
Peoic

Pict. No. 8. The 10 ft. gas engine model with which Joe Kovel broke two world records with a flight of 64 min., 40 sec.

AIR WAYS
HERE AND THERE

What Readers Are Doing to Increase Their Knowledge of Aviation in All Parts of the World. Send Pictures and Details of Your Experiments

Pict. No. 9. Kovel's model in full flight just after the take off!

Pict. No. 1. An aerial view of the contest in action at Hadley Field, N.J.

THE best way we can tell you about the various "air ways" that prevail throughout the country is to give you a complete account of what has been the greatest contest ever staged in the East, if its greatness is dependent upon the quality of the flights made and the satisfaction of the contestants with everything concerned with the meet. The "cream" of many classes of models from various parts of the eastern states was present.

The contest was held at Hadley Airport, three miles south of Dunellen, New Jersey. Many model fans will remember that this airport was the first airmail terminal in the country. The field is operated by Hadley Aircraft Inc., and it was through its owner's generosity, courtesy and far sightedness that the field was obtained on May 25th for this great contest. The model builders owe Mr. Robertson, owner and director of the field, a vote of thanks for the way he helped them to pass a pleasant and profitable day. The young men were allowed to examine the ships inside the hangars as well as outside. A loud speaker system was used to announce interesting events.

Through the courtesy of James Condon we present picture No. 1, which shows you an aerial view of the field and a group of the contestants and spectators. This view was taken during the noon hour, when about two-thirds of the people had left the field to seek nourishment.

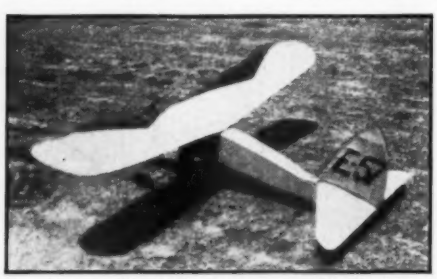
The contest was under the sponsorship of MODEL AIRPLANE NEWS and L. Bamberger and Company of Newark, New Jersey. It was sanctioned by the National Aeronautic Association. Mr. Nathan Polk, of L. Bamberger, and Charles Grant, Editor of MODEL AIRPLANE NEWS, directed the contest. Mr. Polk spent many weeks in careful preparation in order that the contest would run smoothly and afford everyone an interesting time.

The day of the contest, May 25th, dawned clear and beautiful, with a very slight breeze. The personnel was on hand early and had the tables and equipment laid out in an efficient manner before the boys arrived. There was a table or central point of operation, for each event of the contest. The contestants upon arrival, registered, weighed in their models and then proceeded immediately to the group headquarters of each event in which they wished to make a flight. Here the judges were on hand ready to handle them. From the very beginning things ran along smoothly and safely. Flights began early. It was very evident, after very little time had passed, that this was going to be a record day.

The rubber-powered models were the first ones to get into action, as there was more work assembling and tuning up the gasoline models on hand. Before the middle of the morning was over, there were about two hundred contestants busily engaged in knocking down records. Spectators arrived from distant as well as nearby points. At the height of the contest there were approximately 2500 people taking part in or witnessing the flights.

One of the first records to fall was the fuselage record. William Ying of 1273 Bay Street, Rosebank, New York, took his fuselage model off

Pict. No. 4. Left to right, Brad Noble, Bob Long, whose model is shown, Frank Ehling and Wm. Ying, who set world record with his fuselage model



Pict. No. 5. Frank Ehling's gas model which flew out of sight and landed about 35 miles away

Pict. No. 7. Leo Vartanian's club mates busy making ready for flight

Pict. No. 2. Wm. Ying's model starting on its 41 min., 19 sec. flight

the runway for a 41 minute, 19 second flight. One could hardly say that the record was "broken"; actually it was mutilated; for the old record was 8 minutes, 43 seconds. The model was never retrieved and was lost to sight several miles from the field.

Picture No. 2 shows Ying's model taking off on this record flight. Ying is in the background watching expectantly to see what his model intends to do. Shortly after, Jack Haggerty of 1035 Elm Street, Reading, Pa., put up a record for twin pushers with a flight of 18 minutes, 58 seconds.

In picture No. 3 a group of the contestants and judges is shown preparing a twin pusher for flight. We understand that this is a picture of John Haggerty, the winner of the twin pusher event. Will someone familiar with John tell us whether or not this is the case?

The enthusiasm of the crowd as well as the builders began to rise with the realization of what was taking place. Unheard of flights were being run off with great precision. These flights were not alone in greatness, many flights exceeded the old record time. James Throckmorton put up his fuselage model for 20 minutes, 30 seconds; John Ginnetti flew his for 17 minutes, 22 seconds, and Henry Struck's model got away for a flight of 14 minutes, 44 seconds.

In the Twin Pusher Event, Robert Gable flew his model for 12 minutes, 20 seconds. Merrell Malley made a flight with his ship of 11 minutes, 32 seconds.

A number of boys objected before the contest to the unusual size of the fuselage models required, which was Class D. However, the results justified the choice of the judges. An interesting event was the Free For All Event, in which a model builder might enter any type or size of model. Before the contest it was predicted that the "floaters" would "walk away" with this event. However, this did not prove to be the case. Salem Barrack won the event with a flight of 16 minutes, 8 seconds. He flew a fuselage model of regular design which was very slightly below the weight rule, but in no way could it be called a "floater." William Wert was second with a flight of 15 minutes, 4 seconds; George Aspiotis was third with a flight of 14 minutes, 15 seconds; and George Brown was fourth with a flight of 14 minutes, 4 seconds. Martin Faynor made a flight of 10 minutes.

In no contest that has ever been staged has such an array of record times been made. In every event except the Glider Event, the first five contestants made flights of over seven minutes.

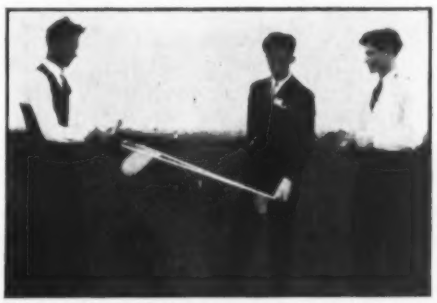
In the Glider Event no record existed. The contestants were not allowed to throw the models into flight; but were required to launch them with the use of a catapult with a pull of one pound. Edgar Franklin of 60-19th Street, West New York, New Jersey, won this event with a flight of 40 seconds. George Brown also made a 40 second flight, but Edgar Franklin made a second flight of 35 seconds. Brown made no official time at all. First place was, therefore, given to Franklin. George Brown was second. Henry Hohner was third with 35 seconds, and Salvatore Ippolito was fourth with 33 seconds.

One of the unusual incidents in the

(Continued on page 34)

Pict. No. 12. Nathan Polk, a director of contest and the Bamberger Aero Club, was a busy man

Pict. No. 13. Mr. Grant, a director of the contest, weighs in John Haw's fuselage model



Pict. No. 3. Jack Haggerty prepares twin pusher for flight. He won first place in the event

Pict. No. 10. The end of a perfect day—and a month's hard work

Pict. No. 11. Great excitement prevails among the spectators as a gas job takes to the air

Pict. No. 6. Leo Vartanian's gas model in full flight. He won third place

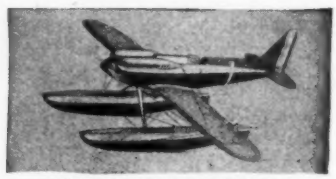
Pict. No. 14. Members of the Holman Model Airplane Club of St. Paul, Minn., with their biplane gas job

Pict. No. 15. An exhibit of models built by members of the Syracuse Model Airplane Club

Cleveland's Modelin' Bill Says: "THE WO

"Yes, the whole country, and why shouldn't they? Take this Hawk design 21 for instance, did any of you model builders, even just a few years ago, think you would ever see such a beautifully designed scale model that would fly? I didn't, and I've been building models for many a year. This is not all either. I am given to understand that what we modelbuilders have already seen ain't nuthin' yet, because Cleveland has some new surprises in store for us.

"Why, when I first planned building the Hawk, I couldn't make up my mind whether I wanted ½" or ¾" scale, so I got *both* kits. When I opened 'em up on my workbench, I was amazed at the similarity of completeness and extreme accuracy and detail in each of these two numbers. I've examined and built hundreds of models, but take it from me, model buildin' friends, Cleveland's are the best by test, and that's why they've become the standard of comparison throughout the world."



FAMOUS SUPERMARINE S6-B

"Just the ship for vacation fun"

Embodies faithful miniature detail of that famous British speed plane that won the 1931 Schneider Cup Race. Most interesting to build with its fuselage side and bottom radiators. Swift and pretty in flights, particularly **ROW (rising off water)**. Span 15", length overall 14½". Colored gleaming silver and blue. Kit D-19..... **65c**

WI

They will, doubt, exterior d il c stringer mit solid (or) s

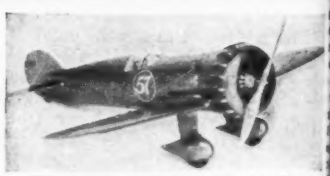
They are com liquids (w p of course, ta

With but exce precisely sca as far as al absolutely there on either scale

Last, but their at their 25 than one ly is

IF YOU SEE MITTANC A TR THE P-LAS HEATH, SEE MUST SE TO

BUILD THESE SIX THOMPSON TROPHY WINNERS



TURNER'S WEDELL-WILLIAMS

Another ship needing no introduction since our beloved Col. Roscoe controls it wherever she goes. The '34 Thompson Trophy winner. Fast flying model. An extremely popular model that attracts a great deal of attention wherever it is displayed. Suggested coloring: Wedell-Williams Gold. Has a span of 13", length 11". Kit D-48, postfree..... **50c**

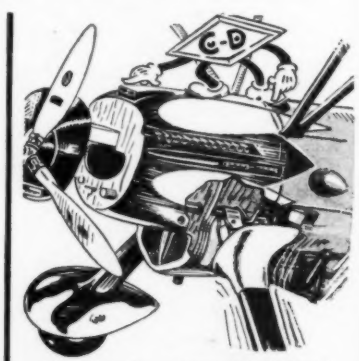
WEDELL-WILLIAMS

This model is a very beautiful and authentic version of the plane Jimmy Wedell himself flew to victory for the 1933 Cup. The same ship that "Doug" Davis flew in 1934. Capable of excellent speed flights. Suggested coloring: red with black scallooping and bronze motor crankcase, and color separations. Span 13", length 11⅛". Kit D-47..... **50c**

CURTISS P-6E ARMY HAWK

A model as beautiful as any ever built for the most exacting exhibition requirements, yet, it is capable of very good flights at a fast clip in true fighter fashion. Every possible external detail, wing ribs, stringers, etc., reproduced. All parts requiring machine work, such as turnings, etc., completed. Only the pleasant handwork left to be completed. Suggested coloring, yellow and olive drab with the beautiful Hawk color striping of black and white, characteristic of the Selfridge Field Squadron. Fuselage owl and U.S. Insignia comes ready to apply. Span 15¾", length 11⅛", Kit D-21..... **75c**

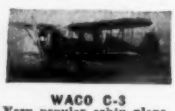
See the back cover of this issue for our super complete C-D ¾" scale models



Cleveland's "Super-Modeling" Construction Details

Close-up of removable nose and moving landing gear strut as on ¾" model Hawk. ½" model same, but landing gear stationary.

WANT NEW C-D'S? Then send votes in on just what you'd like to see designed, listing up to ten aircraft designs as well as anything else in models you would like to see as a C-D design.

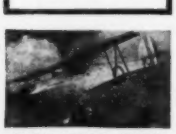


WACO C-3

Very popular cabin plane. Span 16½", length 12¾". Suggested coloring: silver and red. Kit D-37..... **75c**

MONOCOUPE

Span 16", length 10¼". Suggested coloring: Beautiful cream and orange. This design has won many first prizes for model-builders. Kit D-28..... **45c**



HIGH-SPEED FURY

British Hawker interceptor fighter. Now redesigned and beautifully striped top wing and fuselage, lettering under wings, etc. Long, fast flights. Span 15", length 13". Suggested coloring: All silver. Kit D-20..... **45c**

HEATH PARASOL

Span 15½", length 8½". Suggested coloring: mostly orange, decorative black fuselage side panel. Excellent for beginners, and a duration flyer. Kit D-26..... **35c**

LOCKHEED VEGA

A picture for beauty—a wonder for flights. Span 20½", length 14". Suggested coloring: brilliant red and cream. Kit D-24..... **85c**

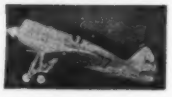
See Your Dealer First

as many new dealers are being established every day. If he can't supply you, order direct, giving his name, address and type of store he operates (hardware, sporting goods, department store, etc.)

★ ★

COMPER SWIFT

Redesigned. Excellent flights. Span 12", length 9". Suggested coloring: beautiful green, with black fuselage design. Kit D-33..... **30c**



HOWARD "PETE"

An easy-to-build Air Race model—fine flights. Span 10", length 8⅝". Suggested coloring: all white, black details. Kit D-18..... **30c**

If your dealer can't supply you

IF ORDERING DIRECT—add 10c per Kit for packing dozen or more are ordered at one time, there is no —cash at your own risk. Shipments *ALWAYS* rushed other foreign countries, add 20%. Also see "Liquids"

DEALERS! Important Mess

CLEVELAND MODEL & SUPPLY CO., INC., 1866NH West 5 Cleve

VDLE COUNTRY'S TALKING ABOUT 'EM!"

Wh warf Kits Are Like

will, doubt, build up better ½" scale flying models, or de considered such as authentic rib spacing, ter pr imitations of metal cowling, etc., than even (or e) scale model Kits possibly could be.

are c complete "dry" Kits, but simply have the ls (wa, paper cement and colors) eliminated and, rse, e tape included.

but t exceptions in three or four designs, they are sely l scale Kits which are complete with liquids r as g al details are concerned, otherwise they are utely t therefore the same photographs may be used ther V scale models.

but t their real value is almost beyond belief, for eir p 25c to 85c in their complete "dry" state. one c imagine.

OU H SEEN A DWARF KIT YET, SEND RE- TANG A TRIAL ORDER FOR ONE, THE HAWK, P-3 AS O-38 OR EVEN AN "IKE" OR A TH. SEE WHAT THEY ARE LIKE, FOR YOU T SE TO REALLY APPRECIATE THEM.

NAVY BOEING F4B-3 (or -4)

Capable of fairly long flights. Span 12", length 10¼". Suggested coloring: silver, yellow and red. Kit D-29..... **65c**

U.S. ARMY BOEING P-12E

Excellent flying model. Span 15", length 10¼". Sug. color: yellow and o.d. with beautiful red and yellow trim. Kit D-8..... **65c**

NAVY CURTISS F11C-2

The plane which needs no introduction as it has already made an excellent name for itself in Navy work. Beautiful flying model. Suggested coloring: the characteristic silver with gray fuselage, green tail surfaces, cowl and other trimmings, and yellow upper wing. Span 15¾", length 10⅝". Kit D-49..... **85c**

BOEING P-26 STANDARD PURSUIT

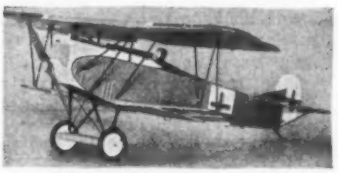
Formerly the XP936. Very popular. Much imitated. The most modern pursuit model of a low wing design. Authentically detailed to the tiniest gadget. Span 14⅛", length 12". Suggested coloring: yellow and olive drab. Kit D-23..... **65c**

VOUGHT CORSAIR V-65

Make either of the new 2-place Corsairs (V-65 or V-80). Super detailed, extremely realistic. Really fine flights may be expected of such large models. Span 18", length 13¼". Suggested coloring: blue, yellow, red, black and silver. Kit. D-41..... **85c**

DOUGLAS O-38 OBSERVATION

Very beautiful and unusually well detailed model. Authentic only as "Cleveland" makes 'em! Span 20", length 15¼". Suggested coloring: yellow, olive drab, black details. 2 pilot blocks. Kit D-43..... **85c**



FAMOUS WARTIME FOKKER D-7

This is probably the most beautiful of all authentic wartime models, for, with its true D-7 line, it might even have been drawn from one of the famous German Flying Circuses. Suggested coloring orange, with green wing tips, top and bottom wings, top and bottom of fuselage and tips of elevators and stabilizers, a beautiful white nose, wheel disks, rudders, fuselage cross and divisions between the green and orange. Struts and finer details in black. Has authentic Spandau guns, beautiful scale propeller and pilot, all the little control surfaces move, and best of all, you can easily make them all with the wealth of detailed instructions such as only Cleveland supplies. Span 14⅛", length 11¾". Kit No. D-15..... **60c**

AERONCA C-3

Easy for beginners. Span 18", length 10¼". Suggested coloring: Red and silver. Kit D-40..... **60c**

See the Back Cover

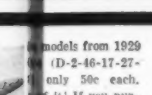
Don't forget to see the back cover of this issue for the world famous C-D ¾" scale models too, especially the Thompson Trophy winners.

BOEING 95 MAIL

Easy for beginners. Redesigned for beauty and even greater duration than ever before. Span 22 3/16", length 16". Suggested coloring: blue and silver. Kit D-32..... **85c**

GREAT LAKES SPORT TRAINER

One of the prettiest models available. Easy to build. Excellent flights. Includes Cleveland's latest features and loads of details. Span 13⅝", length 10⅝". Suggested coloring: orange and cream. Kit D-16..... **65c**



models from 1929 (D-2-46-17-27- only 50c each. r it! If you purem individually, st 10c extra for and handling, six or more are ed, no extra eed be included. send your $3.00 six models.

GEE-BEE RSPORTSTER

tle's 1932 pson winner— beauty. Fast . Span 12¼", 9". Suggested g: white, red, ping. D-27..... **50c**

LE'S GEE-BEE

Race sensation. ", length 8¼", d coloring: yellow k. **50c**

TRAVEL AIR MYSTERY SHIP "R"

Grandaddy of all modern commercial and military planes. The most outstanding ship of its time and which it is said would probably still "hold its own" among the best, with a more powerful motor such as those employed in the later Thompson races, but as it was, it won the 1929 race and was the first airplane ever to out-perform military aircraft in a free-for-all. Its best speed was 240 m.p.h. The model span is 14½", length 10½", and may be completely filled in to represent the plywood structure. May be very beautifully colored as its prototype was with red with black scalloping and fine green striping separating scallops and red. No model fleet is complete without one and its low price. Order Kit D-2..... **50c**

Famous '30 LAIRD SOLUTION

It was piloted to victory by the late "Speed" Holman in the Thompson Trophy Classic. Model flies like the Super-Solution—at a fast clip. Suggested coloring: gold wings and tail surfaces, balance black. Span 10⅝", length 9⅛". Order Kit D-46..... **50c**

HOWARD RACER "IKE"

Flies and climbs beautifully. Span 10¼", length 8⅛". Suggested coloring: white with black details. Kit D-42, only..... **25c**

LINCOLN SPORT

A lightplane sensation Beginner's model. Span 10", length 8 1/16". Suggested coloring: cream, black trim. Kit D-36..... **25c**

Arrows here Models

all C-D re authen- odels, we use, as the same as 1n ads—for models ¾" scale, job in precise-

The #17 Catalog

showing complete C-D line (31 Dwarfs, and 50 ¾" models), also listing all Cleveland's quality supplies — mailed anywhere upon receipt of 5c. (Or equivalent in unused foreign stamps from countries other than Canada.)

FOKKER TRIPLANE

Plane of Germany's greatest ace, Von Richthofen. Span 11¾", length 9⅝". Suggested coloring: all red. Kit D-14..... **45c**

A-W QUAD FIGHTER

Very unusual Steady flyer. New authentic rib spacing. Easy to build. Span 14", length 12¼". Suggested coloring: red, white and blue. Kit D-11..... **45c**

LIQUIDS

Since all Dwarfs are absolutely complete, except for liquids and striping tape, you may wish to purchase liquids along with your Kit in the event you do not have the particular ones necessary for that design. Generally speaking, if one has a fair amount of experience, ½ oz. of wood and paper cement will probably be sufficient for assembling the entire model. the larger models, of course, or for those not having much experience, we would recommend 1 oz. of each be ordered, except for models priced at 35c or less. For the colored dopes of the fine quality of Cleveland dopes, ½ oz. of each color is sufficient to give one good coat at least, and on models such as the 15" Fury, perhaps 1 oz. of silver will go farther than one would expect for the entire job. For the larger models, the two or three main colors (usually mentioned first) should be purchased in 1 oz. quantities, but even on these larger quantities, using care, ½ oz. will easily give at least one good coat. If you wish to build up a little reserve stock, 2 oz. sizes of all liquids necessary might be ordered. Of course, for perfect color division or striping, striping tape should also be ordered. This is only 5c per card with instructions for use. It's easy to color now.

CLEVELAND'S HIGH QUALITY DOPES AND CEMENTS

Balsa Wood Cement	Paper Cement
Anti-Blush Thinner	Clear Gloss
Clear	Silver
Diana Cream	Military Yellow
Light Green	Light Yellow
Grass Green	Army Olive Drab
Fire Chief Red	Havana Brown
Medium Blue	Dark Gray
Light Blue	Very Light Gray
Glistening White	Glossy Black
International Orange	Metallic Black

Prices ½ oz. 6c—1 oz. 10c,—2 oz. 18c plus packing charges of 15c PER ORDER, the same as for any parts order over and above the Dwarf packing charge necessary. For jobs requiring gold, Laird Gold, Weckel Wms. Gold and Severaky Copper Bronze at 5c per envelope available, sufficient for 1 oz. of clear dope, to be used within three days after mixing.

please follow these instructions

handling charge. We always pay postage ANYWHERE. If half handling charge. No C.O.D.'s—send check, or money order nada, Mexico and British Isles, add 10% to above prices; Ohioans only, send the 3% Sales Tax for all purchases.)

for You on Back Cover. SEE IT!

ND C-D

Cleveland, Ohio, U. S. A.

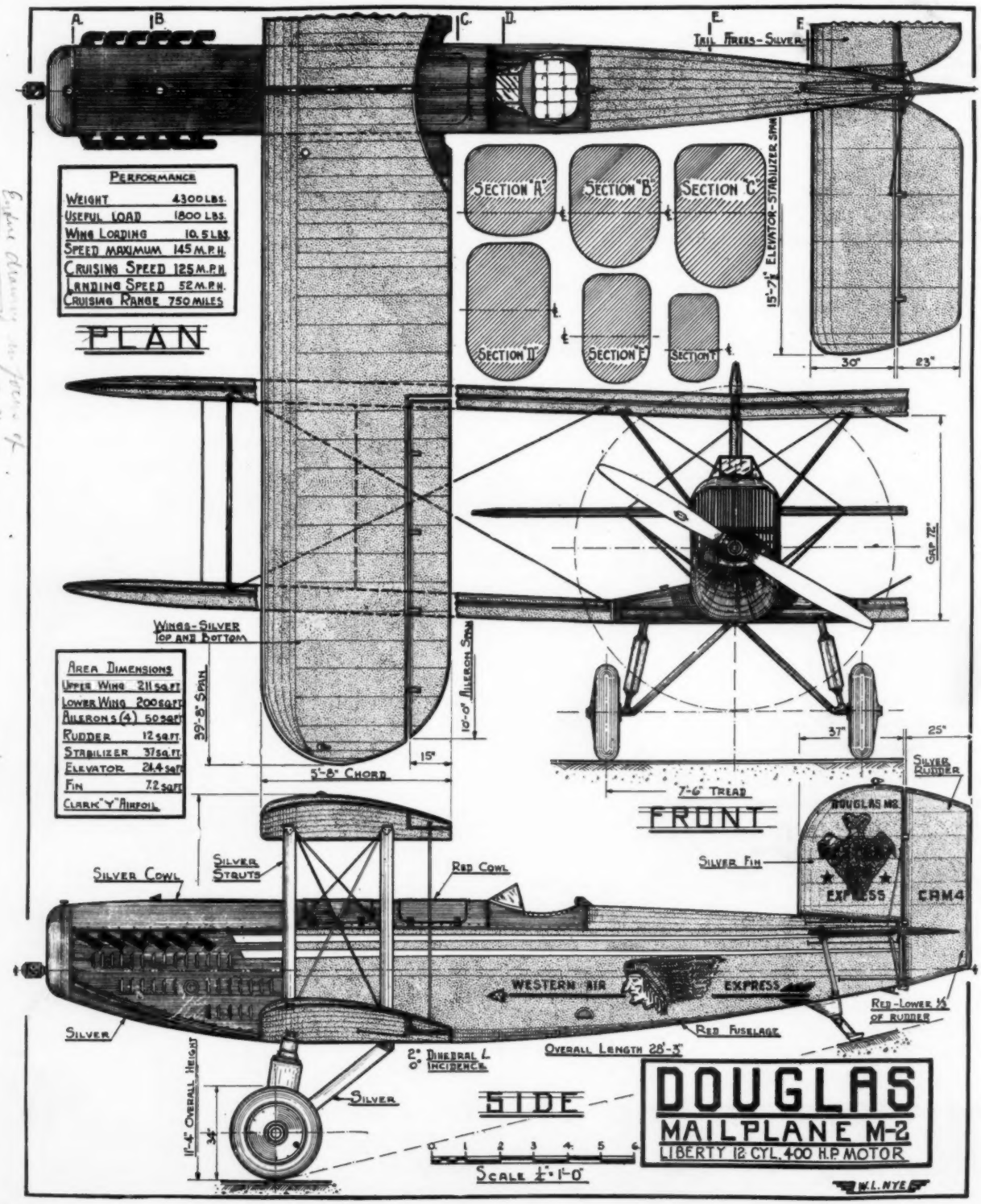
★ ★

Douglas Mailplane M-2

DURING the latter period of the early air-mail-carrying operations by the Postal Department, this airplane did the majority of the mail-carrying after the DH4M type of plane was washed out as obsolete. This plane was chosen after it had fulfilled the required specifications over its competitors in the government mail plane competition, and upwards of fifty were constructed.

This plane is a direct descendant of the Douglas O-2 army observation plane, the only difference being the cockpit arrangement. It is designated in military use type O-2E. The construction is of composite materials. The wings are of wooden construction

(Continued on page 38)



The Aerodynamic Design of the Model Plane

ARTICLE No. 42 CHAPTER No. 4

An Estimation and Discussion of Comparative Performance of Single and Multiple Rubber Motor Power Units

By CHARLES HAMPSON GRANT

IN PAST articles of this series, the quality of rubber motors has been carefully considered in regard to the torque they produce and the number of turns and amount of work that they will deliver. The relationship of these mathematical quantities to the *number of strands in a motor* (motor cross section area) and the size of each strand has been shown. Briefly it has been found that approximately: (Q) is proportional to $\sqrt{N^3}$ or $N\sqrt{N}$; (T) is proportional to $\sqrt{\frac{1}{N}}$; and (W, is proportional to (N), where (Q) represents the torque, (T) the turns per unit of motor length, (W) the amount of work and (N) the number of strands of a given size in a motor.

Now it is well to consider how this knowledge can be applied usefully in estimating the general performance of model planes.

Comparative Performance of Motors

The model builder often wishes to know how fast the rubber motor in his plane will drive his propeller and how long it will continue to turn it. These factors determine the type, size and length of the motor which he installs in his model. Of course, these factors vary with the use of different types and sizes of propellers, but for the moment we will not consider this influence but will investigate the proportional performances of motors assuming the *same* propeller is used for all cases.

First, let us consider the speed or rate at which the motor unwinds. We know that the resistance to turning the propeller, or (Q), is proportional to the square of the speed of turning (V^2). That is, if the speed is doubled, the resistance is four (4) times as great. So we see that $Q = KV^2$. But $Q = K(N\sqrt{N})$, so $V = \sqrt{N\sqrt{N}}$. Thus we have a means of telling how fast our given propeller will turn with various numbers of rubber strands of a given size in our motor.

For instance, if we have a motor of four strands and we wish to know the *comparative* speed of a motor with eight strands, we proceed as follows:

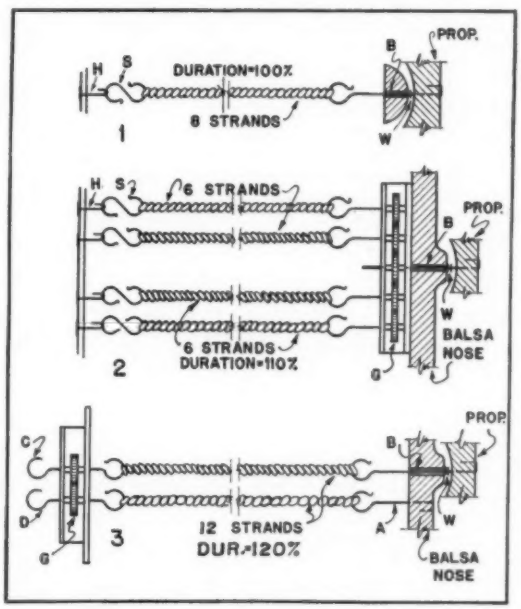
$$V = \sqrt{4\sqrt{4}} = \sqrt{8} = 2.81$$

Then for our eight strand motor,

$$V = \sqrt{8\sqrt{8}} = \sqrt{22.48} = 4.74$$

Now taking (2.81) as 100% we can see that (4.74) equals (168.7%) or the *increase* in the turning speed with *double* the number of strands is (68.7%).

This problem can be solved in a similar manner to determine the number of strands necessary to double, triple, etc., the speed of a propeller, by substituting one, two or three, etc., respectively for (V). Then by solving for (N) when (V) equals one, and comparing it with the result of (V) equaling two, three, etc., you can determine the proportional increase (or decrease) in speed.



However, the quality of a motor with which most model fliers are concerned, is *endurance*, or how long the motor will continue to deliver power. The number of strands of a given size effect a motor's duration very distinctly because with various sizes and numbers of strands, the speed of unwinding changes. With a large number of strands a motor unwinds faster and has *less* duration than a motor composed of a few strands of the same size. In other words, the faster a motor unwinds, or turns the propeller, the less the duration. So we can say that $E = \frac{1}{V}(K)$, where (E) represents the duration. We know that $V = K\sqrt{N\sqrt{N}}$, so substituting we have, $E = K\frac{1}{\sqrt{N\sqrt{N}}}$.

Thus we have a formula for duration in terms of the number of strands by means of which we can determine *comparative* durations. The model designer must remember however, that all factors such as motor length, size of strands, quality of rubber used, etc., must be the same in all motors, the duration of which you are comparing. Also, it is assumed that the same propeller is used in all cases.

Now we can go still farther. It can be seen readily that the greater the maximum number of turns that can be stored in motors delivering the same torque (Q), the greater the duration of unwinding, or (E) is proportional to (T), ie., $E = KT$. However, if the torque of the motors considered is not the same, we can say that $E = \frac{1}{K\sqrt{Q}}$ for $Q = K(N\sqrt{N})$.

Then by combining the turns and the torque in correct relation to (E) we have $E = K\frac{T}{\sqrt{Q}}$ the duration in terms of the turns (T) and the torque (Q), (K) is merely a constant which shows proportion.

With these formulae, you can determine the relative duration of various motors but not their actual duration in seconds. A calculation of such a nature depends upon the type and size of propeller used, as well as the speed of plane.

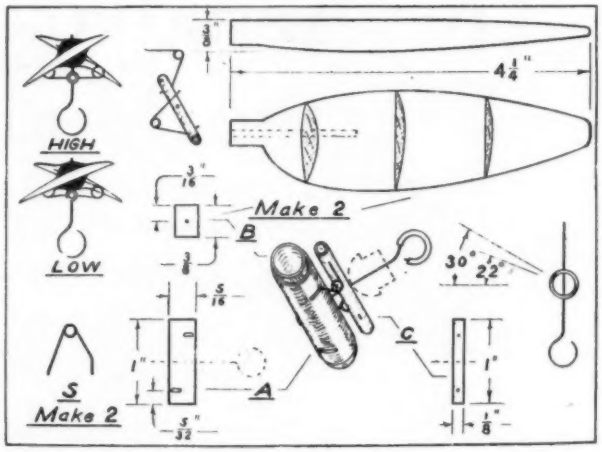
As an example, the formulae may be used as follows:

Suppose your model has a motor of eight strands of 1/8 x 1/30 rubber but you wish to build a model of twice the duration, the motors in both planes being of equal length and composed of the same kind of rubber. The longer duration in this case is to be obtained by reducing the number of strands used in the motor, and by lightening the construction of the model so the reduced number of strands will fly it properly. The fact you wish to know is, how many strands should be in the motor in order to double the duration? The correct formula to use is, $E = K\frac{1}{\sqrt{N\sqrt{N}}}$. First solve for a value of (E) with (N) equalling eight (8), as $E = \frac{1}{\sqrt{8\sqrt{8}}} = \frac{1}{\sqrt{22.48}} = \frac{1}{4.74} = 0.211$. Now solve the formula for the case of the model which is to have *twice* the duration, substituting twice (0.211) or (0.422) for (E), as $0.422 = \frac{1}{\sqrt{N\sqrt{N}}}$.

Then as $\sqrt{N\sqrt{N}} = \sqrt{N^3}$, $\sqrt{N^3} = \frac{1}{0.422} = 2.37$ or $\sqrt{N^3} = 5.6$. (Cont Pg. 46)

An Automatic Variable Pitch Propeller

By C. L. BRISTOL



THE model plane builder who keeps abreast of aircraft development must have a variable pitch propeller that is light, easily constructed and automatic in its action. The propeller shown in the accompanying drawing answers all of these requirements. Larger or smaller props may be had by reducing or increasing the dimensions to suit the builder's needs.

The hub "A" and the blade bushings "B" are cut from a pair of fishing rod ferrules or any similar pieces of telescoping tubing. The hub, cut from the outer ferrule or tubing, is center drilled for the propeller shaft and slotted as shown at each end to receive the spring arms "S," which pass entirely through the hub and supply the pitch-changing action. These springs are bent over the layout given, using number 8 music wire. An auxiliary hub, "C", is made from smaller tubing or hollow wire and center drilled to slide freely on the propeller shaft. Holes at each end provide a mounting for the springs "S" and they should be soldered at this point only. Two balsa blades are cut out and sanded as shown in the pattern, and provided with a dowel reinforcement as indicated by the dots. The collars "B", drilled as shown, are cemented on the ends of the prop blades and protect them against the wear of the twisting action.

(Continued on page 46)

How to Make a Simple Tailless Sailplane

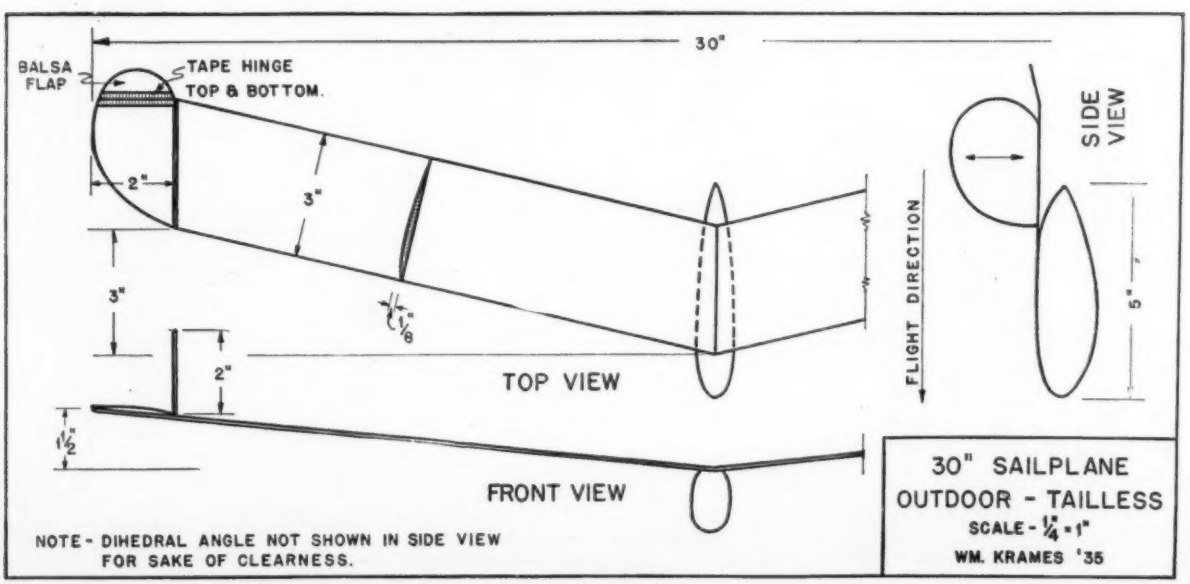
By WILLIAM KRAMES

HERE is a novel sailplane that is not difficult to construct and is capable of extended durations when flown under favorable conditions. Launched in hilly country, against a light breeze, it will soar for several minutes. If the model is dropped from a kite on a warm day, it will remain in the air indefinitely and may even disappear in the clouds.

The wing is made from a balsa board measuring ⅛" x 3" x 30". Cut the board in half at the center and cut the wing tip on one-half, and use that half as a pattern to cut the other tip. Next, sand a good airfoil section into the wing and use very fine sandpaper to finish it off. Finally lay the halves on a flat surface and cut the inside ends of the wings so that when they fit together each tip will be swept back three inches. The two fins are cut and sanded from ⅛" flat balsa and should be securely cemented to the wing as shown in the drawing. The trailing edge of each fin is turned outward from the center 1/32", which tends to give the model excellent lateral stability.

The fuselage is carved to a neat, streamline shape from a hard balsa block measuring 1" x 1½" x 5". The next step is to cement the wing to the fuselage. Use plenty of cement at this joint and while it is still wet, raise each half of the wing one inch and use books, prop blocks, etc., to hold it in that position until the cement is thoroughly dry.

When adjusting the model for flight, use small brads sunk in the nose for ballast. Strive to get the gliding angle as flat as possible. The model is a little trickier to adjust than the conventional form of sailplane, but its performance is really unusual and often surprising. High in the air on a sunny day, it is not unlike a lazy seagull, veering and turning, in response to the breezes.



NATIONAL AERONAUTIC ASSOCIATION
JUNIOR MEMBERSHIP NEWS

Prepared by National Aeronautic Association, Dupont Circle, Washington, D. C.

Get Your Model Planes Ready Now for the National Championship Meet
New Records and New Champions Likely at St. Louis June 27-29

PRESIDENT William G. McAdoo's challenge to the aviation industry to restore American supremacy in the air has been heeded. Under N.A.A. sponsorship, the first attack on world air speed records was launched last May and within 48 hours, eight major world records were returned to America.

The drive is just getting under way. Within the next few weeks, new attacks are to be launched by leading aircraft manufacturers and pilots which should place America first on the international air score sheet. Today France leads America by the scant margin of three records.

The first record attempt was made on May 16 and the second was staged two days later. At the end of the trials, a Douglas plane with Pilot D. W. Tomlinson had broken eight world records. Pilot Tomlinson flew part of the time in threatening weather, but persevered until he had reached his goal. His best mark is the new record of 191.674 miles per hour over a 1,000-kilometer course carrying a 2,000-kilogram load.

New England Championships

THE Jordan-Traveler Junior Aviation League, N.A.A. snappy junior chapter of Boston, held its annual New England Championship Model Airplane Meet on Saturday and Sunday, May 25 and 26. Indoor flying was in the Boston Garden on Saturday and outdoor flying in Harvard Practice Field on Sunday.

Sweeping aside all competition, Robert Shea of Roxbury, one of the latest members of the Junior Aviation League to reach expert class, flew his fuselage R.O.G. model and his tow-launched glider model to two first places. Repeating her work of last year, Barbara Maschin of Westfield, outstanding girl flyer, took first place in the hand-launched stick model event. Her time of 3 minutes 20 seconds was ten seconds better than the nearest flight. These were the outdoor winners.

Torrey Capo was the only other contestant to place in all three of the outdoor events. Through this splendid showing he gained enough points in the meet to creep up on the second place annual point holder.

The indoor flying saw four new Boston records. Phillips made 29.8 seconds with his hand-launched glider. Tyler did 7 minutes 50 seconds with his R.O.G. fuselage model. Carlson, from Springfield, won the R.O.G. stick event and the hand-launched stick contest with 8 minutes 43.4 seconds and 13 minutes 22.2 seconds respectively.

Outdoor Results

Gliders

Shea	30.6 sec.
Kenney	29 sec.
Capo	28.8 sec.
Long	21.4 sec.
Barrett	19.2 sec.

Stick Hand-Launched

Maschin	3 min. 20 sec.
Peterson	3 min. 10 sec.
Shea	3 min. 10 sec.
Capo	2 min. 55 sec.
Long	2 min. 55 sec.

Fuselage R.O.G.

Shea	4 min. 40 sec.
Peterson	3 min. 25 sec.
Capo	2 min. 50 sec.
Sobansky	2 min. 50 sec.
Mitchell	2 min. 31 sec.

Indoor Results

Gliders

Phillips	29.8 sec.
Capo	28 sec.
Shea	24.4 sec.
Sampson	24 sec.
Tyler	23.5 sec.

Stick R.O.G.

Carlson	8 min. 43.4 sec.
Capo	8 min. 32 sec.
Mitchell	8 min. 08 sec.
Phillips	7 min. 19 sec.
Marchi	7 min. 00.4 sec.

Fuselage R.O.G.

Tyler	7 min. 50 sec.
Phillips	5 min. 49.9 sec.
Fleming	5 min. 21.4 sec.
Capo	5 min. 00 sec.
Coughlin	4 min. 07.8 sec.

Stick Hand-Launched

Carlson	13 min. 22.2 sec.
Oates	12 min. 36 sec.
Phillips	12 min. 13 sec.
Tyler	11 min. 47.8 sec.
Fleming	11 min. 39.4 sec.

David B. Hecht with his twin-pusher model, St. Louis bound

This meet is the last big event that Captain Willis Brown will run in Boston for the League as he has accepted an offer from Virginia to become a director

NATIONAL AERONAUTIC ASSOCIATION OF U.S.A.
DUPONT CIRCLE
WASHINGTON, D.C

I hereby make application for membership in the National Aeronautic Association as a Junior Member, I am under twenty-one years of age.
I enclose fifty cents for intiation fee and first annual dues (Use check or money order).

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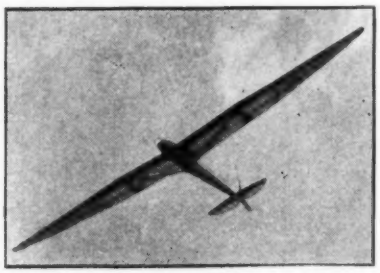
(Please print or type)

Street .....

City ..... State .....

Date of Birth .....
(Month, Day, Year)

Approved .....
(Parent sign here, if applicant is under eighteen)



Lewin Barringer, President of the Pennsylvania Aero Club, soaring at Elmira in his Bowlus-du Pont Albatross

of a large school there. His short-wave radio-controlled timing of outdoor contests has become standard practice in Boston.

As a result of their season's work three J.A.L. members won trips to St. Louis as representatives of the Boston chapter. These are Hewitt Phillips, Bruno Marchi and Torrey Capo. The year's point totals are: Phillips 14,916, Marchi 11,690, and Capo 11,646. Phillips' total is a new high in Boston competition. It will be interesting to watch next month's issue to see how the Boston fellows fared at St. Louis.

Lakehurst Indoor Meet

THE second indoor meet at Lakehurst in the large dirigible hangar, on May 18 produced six new records, three of which belong to William Latour, 21, of Philadelphia. It also witnessed the first time that two models in competition on the same day flew more than twenty-one minutes each indoors. Mr. E. A. Walen had flights of 21 minutes 42 seconds and 21 minutes 21 seconds. George Aspiotis had a flight of 21 minutes 04.4 seconds.

Results:

Baby R.O.G.

William Latour (new record)	9	min. 50	sec.
George Waite	7	min. 50.2	sec.
Herbert Greenberg	7	min. 15	sec.

Class B Stick R.O.G.

Mayhew Webster (new record)	15	min. 00.4	sec.
William Latour (new record)	14	min. 02.8	sec.
Theodore Golomb	10	min. 20.8	sec.

Class B Stick Hand-launched

Roy Carlson (new record)	16	min. 45.6	sec.
William Latour (new record)	15	min. 17.8	sec.
George Waite	14	min. 59	sec.

Class C Stick Hand-launched

Ernest A. Walen	21	min. 42	sec.
George Aspiotis (new record)	21	min. 04.4	sec.
Mayhew Webster	16	min. 07.2	sec.

Class B Fuselage R.O.G.

Daniel Clini	10	min. 10.2	sec.
Jesse Bieberman	6	min. 05.2	sec.

Class C Fuselage R.O.G.

Ernest A. Walen	11	min. 39.8	sec.
Stanley Jonik	10	min. 33.6	sec.
George Aspiotis	9	min. 20.2	sec.

Eastern States Meet

THE results of the Eastern States Meet are published elsewhere in this issue so that no detailed account of the meet will be given here. However, such exceptional times were recorded that it would not be justifiable to pass by without comment.

The wind velocity on the day of the meet, May 25, was practically zero, the atmosphere was clear and warm, cumulus clouds passed overhead all day and made such excellent thermal currents that the models were pulled right up into the clouds. Even the heavy gasoline powered models soared like gliders.

THE National Aeronautic Association offers you model builders and flyers membership in a national aviation organization that insures recognition of record-making flights, quarterly bulletins that will keep you up to date in the latest refinements of the art, together with the realization that you are working right along with the leaders in national aviation. The Association aims to keep "America First in the Air." Those under 21 are entitled to membership as junior members at 25 cents a year with an additional initiation fee of 25 cents. Those over 21 may become regular members at $5 a year. A special model flying permit is offered to non-members who are over 21 at $1 a year.

Only N.A.A. members or those with special permits are eligible to compete for N.A.A. trophies and awards, or to have their flights given official recognition for record purposes. As the representative in the United States of the Federation Aeronautique Internationale, the Association has as a special responsibility the encouragement and regulation of air meets, races, and record trials.

There were at least five gas models that did more than an hour. All except Kovel's, however, passed out of the timers' sight before the hour. Ehling's model is believed to have done better than four hours. It was reported by a Douglas Air Liner, several hours after taking off, to be soaring at 5,000 feet over Trenton. The model was subsequently recovered about four miles outside of Trenton.

William Ying's fuselage model under rubber power reached a soaring height very easily and hung over Hadley Field for the amazing time of over 41 minutes. Jack Haggerty, 15, of Reading, Pennsylvania, a newcomer to the big meets, did nearly 19 minutes with his twin pusher model. Such excellent flights are not possible excepting on perfect days and with properly designed models.

It is certain that such records will stand for a long time but it is not at all probable that they will not eventually be exceeded. The weather will be kind again and new records will always be making their appearance.

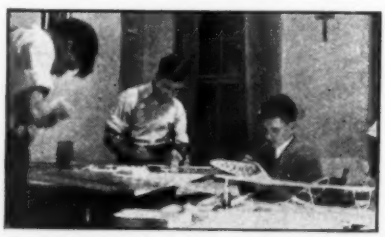
Brevities

THE Society of Model Aeronautical Engineers, the body governing model aeronautics in Great Britain, announces the following names as those to represent Britain in the Moffet Contest at St. Louis: J. W. Kenworthy, C. T. Buffery, P. L. Wilson, C. S. Rushbrooke, L. Rushbrooke, and D. E. Bianchi. It is noted that the only repeater from last year is Mr. Kenworthy. We are all anxious to see the British models at St. Louis, this being written before the National Meet.

The "Albatross," Bowlus-du Pont sailplane of the late Warren Eaton, has been presented to the Smithsonian Institution by Mrs. Eaton. Warren Eaton was the foremost exponent of gliding and soaring in America and was founder and first president of the Soaring Society.

Out for an all time altitude mark are Captain Rudolph N. Williams and Captain Orville Anderson of the Army Air Corps in the National Geographic stratosphere flight. They have recently received F.A.I. balloon pilot certificates as well as N.A.A. sporting licenses.

Sleek and speedy is the new Brown racer of Lee Miles, who flew away with America's racing championship last year. Perhaps with this snappy outfit, 1935 will see Miles again adjusting new laurels upon his brow.



Preparing for the National Meet. Smithline, Kovel and Young burning the midnight oil

Carl Goldberg, this country's leading indoor model flyer, reports that his newest creation has demonstrated its theoretical ability to do over thirty minutes under ideal conditions. It was Goldberg who did almost twenty-three minutes last year in the Goodyear-Zeppelin Air Dock at Akron. He has improved his stick construction giving more strength with less weight. The model flies with a seventeen-inch propeller and 3/32-inch rubber.

Make America "First in the Air"

"THE Man on the street must be told the real story of aviation, and the National Aeronautic Association is the ideal organization to do the job," stated Glenn L. Martin at a breakfast meeting attended by leading aircraft executives and government officials at the Mayflower Hotel in Washington last month. Mr. Martin strongly urged support of a national program on behalf of aviation and emphasized the necessity of the N.A.A. becoming truly representative of every section of the United States in its membership.

A distinguished group had assembled at this meeting to discuss ways and means to bring aviation within a proper understanding by the American public. The biographies of those present would fill several pages in a "Who's Who" of American aviation. The group unanimously favored the immediate inauguration of a nation-wide educational program to acquaint the public with all phases of aeronautics.

Every speaker expressed himself forcibly concerning the necessity of carrying out the previously announced program of the N.A.A. Proper appreciation of the importance of aviation in our national safety, return of the major world air records to the United States, development of the interest of the nation's youth in model plane building and in model flying meets, and sponsorship of both local and national competitions and performance tours, were referred to frequently as the major activities requiring immediate attention.

Among those who attended this meeting were Major James H. Doolittle, who presided; Mr. Harold Pitcairn, Mr. Vincent Bendix, Mr. L. W. Greve, Col. J. Carroll Cone, Major E. E. Aldrin, Hon. William P. MacCracken, Jr., Mr. Edward P. Warner, Mr. Fowler Barker, Mr. Charles Parker, Mr. L. B. Manning, and Mr. John F. Victory.

OFFICIAL MODEL AIRPLANE RECORDS

Approved by Contest Board of the N.A.A.
Through June 8, 1935

INDOORS

STICK MODEL AIRPLANES, Hand-launched

CLASS B

Junior: Roy Carlson	Springfield, Mass.	16m 45.6s
Senior: Ralph Kummer	St. Louis, Mo.	17m 49.8s
Open: William Latour	Philadelphia, Pa.	15m 17.8s

CLASS C

Junior: John Stokes	Huntingdon Valley, Pa.	18m 53.4s
Senior: George Aspiotis	Atlantic City, N. J.	21m 04.4s
Open: Carl Goldberg	Madison, Wis.	22m 59.4s

STICK MODEL AIRPLANES, R.O.G.

CLASS A

Junior: Joseph Pruss	Philadelphia, Pa.	10m 25s
Senior: Merrell Malley	Atlantic City, N. J.	10m 56.4s
Open: William Latour	Philadelphia, Pa.	9m 50s

CLASS B

Junior: Bruce Mackler	Atlantic City, N. J.	10m 22s
Senior: Mayhew Webster	Philadelphia, Pa.	15m 00.4s
Open: William Latour	Philadelphia, Pa.	14m 02.8s

STICK MODEL AIRPLANES, R.O.W.

CLASS A

Junior: William Wert	Philadelphia, Pa.	3m 46s
Senior: Paul Karnow	Philadelphia, Pa.	5m 01.4s

CLASS B

Junior: James Mooney	Philadelphia, Pa.	8m 37.6s
Senior: Mayhew Webster	Philadelphia, Pa.	11m 55s

GLIDERS, Hand-launched

CLASS A

Junior: Kenneth Nelson	Boston, Mass.	26.6s
Senior: David B. Hecht	New York City	34.4s

CLASS B

Junior: Louis Young	Boston, Mass.	27s
Senior: David B. Hecht	New York City	31.6s

CLASS C

Junior: Stanley Congdon	Glen Ridge, N. J.	17s

AUTOGIROS

Junior: Raymond Steinbacher	Ridgefield, N. J.	57.2s
Senior: Alton H. DuFlon, Jr.	Ridgefield, N. J.	2m 01.2s

FUSELAGE MODELS, R.O.G.

CLASS B

Junior: Robert Jacobson	Philadelphia, Pa.	10m 44s
Senior: Herbert Greenberg	Newark, N. J.	12m 23.5s
Open: William Latour	Philadelphia, Pa.	6m 48s

CLASS C

Junior: Hyman Oslick	Philadelphia, Pa.	12m 59.4s
Senior: Emmanuel Enderlein	Philadelphia, Pa.	13m 24s
Open: William Latour	Philadelphia, Pa.	12m 31.8s

FUSELAGE MODELS, R.O.W.

CLASS B

Junior: John Stokes	Huntingdon Valley, Pa.	3m 23s
Senior: Bruno Marchi	Boston, Mass.	3m 11s
Open: William Latour	Philadelphia, Pa.	5m 42s

OUTDOORS

STICK MODEL AIRPLANES, Hand-launched

CLASS C

Junior: Jack Haggerty	Reading, Pa.	18m 58s
Senior: Vernon Boehle	Indianapolis, Ind.	15m 00s
Open: Bernard Collins	Providence, R. I.	3m 23s

CLASS D

Junior: Fred Skafec	Akron, Ohio	8m 21.6s
Senior: Ralph Kummer	St. Louis, Mo.	20m 54s
Open: Michael Marco	Springfield, Mass.	1m 52s

GLIDERS, Tow-launched

CLASS C

Senior: Bob File	Columbus, Ohio	23m 13s

CLASS D

Junior: Stanley Congdon	Glen Ridge, N. J.	45.2s
Senior: Fred Korn	New York City	1m 16.2s

AUTOGIROS

Senior: Ralph Kummer	St. Louis, Mo.	2m 06s

FUSELAGE MODELS, R.O.G.

CLASS C

Junior: Donald Mertens	Erie, Pa.	1m 44s
Senior: Russell Yungbluth	St. Louis, Mo.	11m 35s
Open: Bernard Collins	Providence, R. I.	2m 56s

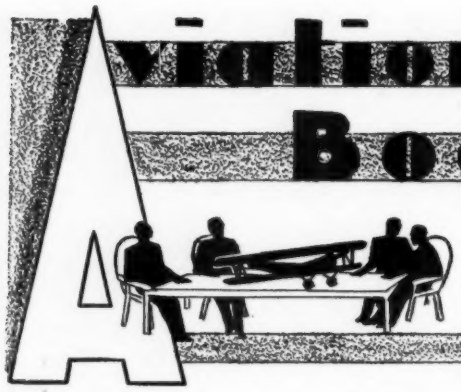
CLASS D

Junior: Alan Starr	Atlantic City, N. J.	5m 41s
Senior: William Ying	Staten Island, N. Y.	41m 19s
Open: Michael Lichstein	Philadelphia, Pa.	1m 28s

CLASS E (Gasoline Engine)

Senior: Joseph Kovel	Brooklyn, N. Y.	64m 40s
Open: Alphonse Bellantonio	Brooklyn, N. Y.	18m 50s

Aviation Advisory Board



Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board
Formerly of
The Technical Section, Air Service, U.S. Army

HERE are a few questions and answers that may open the door to the arena of model building success for you.

Question: Is there any way of telling the amount and length of the rubber used for shock absorbers?

Answer: Yes, the amount and tension of the length of the rubber is determined by the amount of spring necessary in the tail skid, the length of the tail skid, the position of the pivot and the amount of force with which the body bears down on the skid. We refer you to engineering and designing books to determine accurate figures for the design of this part of the airplane.

Question: Is it advisable to use plenty of incidence in the wing of a climbing model?

Answer: It is not essential and neither is this point pertinent. A model could be made to climb with plenty of incidence as well as it could be made to climb with little incidence. It depends entirely upon the relative angle of the wing with the stabilizer. In a climbing model it is advisable to have very little difference in angle between the wing and the stabilizer. It is advisable to set the stabilizer at zero and the wing at one or two degrees angle of incidence.

The thing of primary importance in order to make the model climb, Mr. Clapp has neglected to ask about. It is obvious that the more power applied to the model, other factors being equal, the greater rate of climb the model will have. Another factor which contributes to a rapid climb is large propeller blade area.

We advise the use of brown rubber for climbing models because brown rubber delivers a steadier flow of power throughout the flight. Black rubber delivers a great deal of power at the start of the flight, but this power drops very quickly. Those who have studied the torque charts given in the series of articles entitled, "The Aerodynamic Design of the Model Plane," will appreciate the significance between the two qualities of rubber, as regards power delivery.

Question: Does downward thrust have any advantages besides making a model glide better?

Answer: Yes, a model in which the thrust line is tipped downward will not stall easily. Tipping the thrust line downward creates an advantage when the center of gravity is lowered relative to the thrust line. This set-up of forces causes righting moments to increase when the model approaches the point of stall. It is an extreme help to its stability.

Question: Please explain what is meant by "torsional rigidity" as a term as applied to an airplane wing.

Answer: Briefly, the wing is rigid in a torsional sense if it cannot be twisted about its lateral axis, which axis extends from tip to tip. Possibly readers have seen the wings of a model flutter while in flight. This flutter may be overcome by making the wing more rigid torsionally; or, in other words, making it stronger so that it is more difficult to twist it about the lateral axis. A single surface wing lacks torsional rigidity and can be easily twisted. However, a double surface wing is usually very rigid and is difficult to twist.

Glen Bryant of Venice, Illinois, has some questions. Here they are:

Question: Why is there a wheel placed on the rear end of the fuselage of the Seversky Amphibian?

Answer: This plane, though an amphibian, has to land on the ground sometimes as well as on the water. The wheel is placed at the rear in order to support the rear of the fuselage when landing.

Question: What would it cost, approximately, to take a course in airplane designing?

Answer: The cost depends entirely upon the course you wish to take. If you go to one of the recognized institutes, such as Massachusetts Institute of Technology or New York University, the course will last four years at an approximate cost of $1200 per year. If you have enough energy to do extra work outside of your regular studies, it is possible to earn a little money which will help finance your undertaking. We would not advise you to take airplane designing unless you go to a first class institution.

Question: Does Roscoe Turner hold the speed record for landplanes?

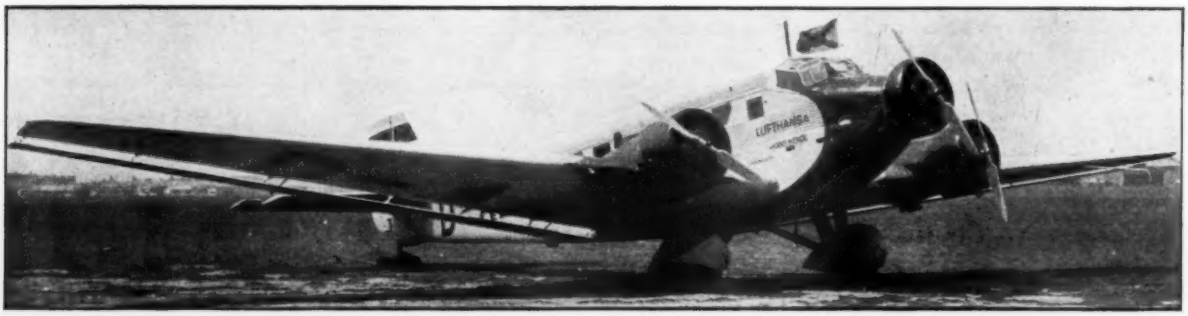
Answer: No. This record is held by a Frenchman who flew a Caudron low-wing monoplane at a speed of about 314 miles per hour.

Question: What is the speed of the Curtiss Swift, the Boeing P26-A and the F4B-4?

Answer: The Curtiss Swift makes approximately 232 miles per hour, as does the P26-A. This speed is in normal level flight at an altitude of about 6000 feet. The F4B-4 has a speed of about 225 miles per hour.

Question: What nation has the fastest pursuit plane?

Answer: It is almost impossible to give an accurate answer to this question; inasmuch as every nation keeps its pursuit plane a dark secret and invariably publishes figures which are not correct. However, it is known that the United States has a



The popular Junkers Ju 52/3m transport, used extensively on German Air lines. It might make a good bomber

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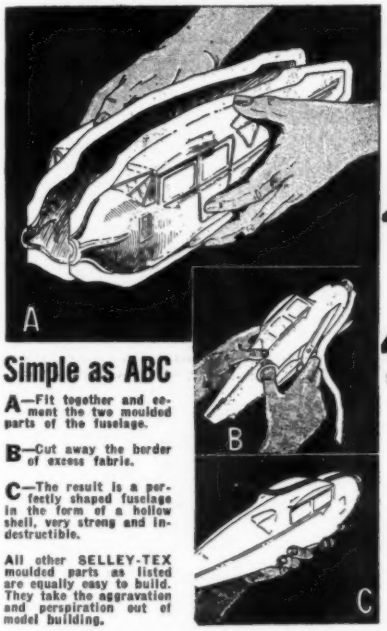
I believe you have something that will make the Model World sit up and take notice. You are about ten years in ADVANCE of all other model companies and have beaten a path for the rest to follow. You have really CONTRIBUTED a worthwhile thing to us modelers and I as one feel duly grateful. Lots of luck.
(Signed) **Homer D. Corwin,**
Bismark, N. Dak.



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The SELLEY-TEX moulded parts included in this kit are shown at the right. These together with special parts and materials as listed complete this outstanding value.

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CLAMPS—RAZOR BLADE, BRUSH, SANDPAPER

ALL 24-INCH WING SPAN

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GOSHAWK 4.00

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GOSHAWK. A powerfully attractive flying scale replica of the speedy Navy fighter and accurate to the minutest detail.

The following SELLEY-TEX moulded parts: Fully detailed fuselage, bulkhead, head rest, balancing ring, drag ring, bombs, belly tank, wheel shoes, shoe fairing, tail wheel fairing and a special fully scaled 9-cylinder motor, detailed with push rods, all the fine scale parts and materials as listed complete this very extraordinary value!

BOEING F4B-4 3.50

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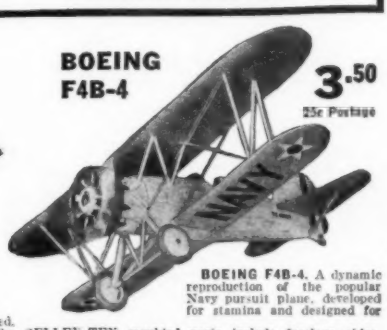

BOEING F4B-4. A dynamic reproduction of the popular Navy pursuit plane, developed for stamina and designed for speed.

The SELLEY-TEX moulded parts include fuselage sides, bulkhead, balancing ring, head rest, wheel fairing and tail-wheel fairing, special scaled 9-cylinder radial motor detailed with push rods and a drag ring. Also the many special parts and materials as listed come in every SELLEY-TEX kit. WHAT A VALUE!

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THE NEW RYAN SPORTSTER. An exceptionally realistic miniature, embodying every modern principle of light commercial planes to assure long distance flying.

The SELLEY-TEX moulded parts included in this kit are as follows: Fuselage, balancing ring, nose piece, spinner, head rest, rudder fairing and combination pants and landing gear; these together with special parts and materials as listed complete this outstanding value.

FREE Write for our beautiful, two-colored broadside containing illustrations and details about the new SELLEY line of incomparable SELLEY-TEX Construction sets. Send 3c stamp for postage.

WACO C Cabin 3.50

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WACO C CABIN. A masterpiece of authentic model design, incorporating every scientific feature to insure maximum flying performance.

Fully detailed SELLEY-TEX moulded fuselage, bulkhead, balancing ring, cowl bumps, pants, pants fairing and a special full-scale 9-cylinder motor, with metal push-rods and a special moulded celluloid cabin windshield; the many special scale parts and materials as listed complete this amazing value.

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FAIRCHILD 22. A magnificent example of practical model construction, embracing durability of structure and ease of performance.

The SELLEY-TEX moulded parts include fuselage, bulkhead, balancing ring, cowl, pants and pants fairing, special 7-cylinder radial motor to scale with push rods, and exhaust fairing, also all materials and special parts as listed complete this remarkable value.

pursuit plane which will travel in the neighborhood of 300 m.p.h. This plane is not a racing plane, but carries armament and can maneuver properly. England has a pursuit plane of the Fury type which will fly at about 275 miles per hour. Information concerning planes of other countries is not available.

Question: Can a person get into the Army Air Corps without a college education? If so, how?

Answer: In order to avoid possible mistakes in answering this question we refer you to the Personnel Division of the United States Army, Washington, D.C.

Question: Would airplanes of the "flying turtle" type, like picture No. 7 in the January 1935 issue of "Air Ways" be practical in the Army?

Answer: It is very doubtful that such a machine would have a practical use in combat. However, its practicability has not been tested or demonstrated, one can only surmise with regard to it. We believe that this plane would not maneuver quickly enough in combat. Visibility is also very poor.

Here are some questions from William Peterson of Ephraim, Utah.

Question: Where is the air speed indicator located on a plane? How does it operate?

Answer: The indicator needle is located in the cockpit in the vision of the pilot. The air tube which takes in the air and registers its speed is located in any convenient point on the airplane outside of the slipstream, where the air flows freely and undisturbed. The air pressure formed in the tube by the airplane speeding through the air is transmitted to the cockpit through the tube, where this pressure acts on a sensitive drum to turn the needle of the speed indicator. It registers the exact speed of the air.

Question: What is the most efficient flying plane in the Army?

Answer: Such a question cannot be answered exactly, for usually it is a matter of opinion and preference of the individual. If you mean in a single-seater fighter, the Boeing F4B-4 is one of the fastest and most maneuverable; also the Boeing P26-A. The Curtiss Hawk is a heavier and fast ship, yet is extremely maneuverable. Probably the most remarkable ship of all is the Grumman Fighter. This is a two-place fighting plane with extremely high speed and is very maneuverable. It has a high speed of about 220 miles per hour.

Question: When getting into a strange airplane, what is the first thing to look for?

Answer: In asking this question Peterson gives us a tough problem. We might be facetious and say the first thing to look for is a place to sit down. He has us guessing in regard to what is in his mind. Probably the first thing you look for is that particular object which would be of the most interest at the time. If you are timid possibly it might be the safety belt. If you intend to fly the ship you would probably see if there was a joy stick with which to control it. Some pilots, in getting into a strange airplane, make sure that the controls are properly hooked up by moving the stick back and forth and operating the rudder bar. On occasions it has happened that the ailerons have been hooked up backward. A crash at Roosevelt Field some time ago resulted from carelessness of the mechanic who did this very thing. The pilot was not killed, but the airplane turned over.

Air Ways—Here and There

(Continued from page 23)

Glider Event was a flight by Edgar Franklin which was not official. It is to be regretted that fortune did not favor him in this. He launched his glider and after about 12 minutes it disappeared in a cloud. It was never found. Had this been official it would have been a world's record in keeping with the times put up by the contestants in the other events.

The event which all but "stole the show," as usual, was the Gasoline Engine Model Event. The crowd was so thick around the contestants who were launching their ships that it was very difficult for them to get their models away in proper fashion. Every means was used to keep the crowd back with ropes, Boy Scouts and finally motorcycle police. However, their number and persistence was so great that they all but stopped the show. We would like to warn anyone who intends to stage a gas model contest in the future to make ample provision for proper policing of the crowds. The gas models became active early in the day. The roar of the little engines could be heard coming in from various parts of the field. However, eventually most of the models of which there were about fifty in number, were centered around the gas event judges.

One of the first models to take the air was a miniature Monocoupe of eight foot wing spread. Spectators who had never seen the performance of these miniature ships were amazed and thrilled. First flights were more or less test flights and were of short duration. However, it was not long before Robert Long sent up a model which completely disappeared from sight at an altitude of about 5000 feet. Everyone gasped at the time of the flight which was 47 minutes, 20 seconds, made under a fuel ruling of ⅛ ounce of fuel for every pound of weight of the model. Long's model weighed approximately five pounds. Shortly afterward Frank Ehling sent up a model which disappeared from sight at 3000 or 4000 feet. The official time was 35 minutes, 6 seconds. These flights broke the previous record of about six minutes, as well as the record of 21 minutes, 57 seconds, made by Maxwell Bassett with ¼ ounce of fuel for every pound of weight of the model. After having lost sight of his ship, Ehling learned that it had been sighted over Trenton, New Jersey, about thirty miles from the field. Bradford Noble also broke the old record with a flight of 27 minutes, 28 seconds. All of these flights were of unexpected duration and astounded not only the crowd but the contestants.

Picture No. 4 shows, left to right, Bradford Noble, Robert Long, Frank Ehling and William Ying with Long's plane which flew 47 minutes, 29 seconds. William Ying, at the extreme right, is the world's record holder for the fuselage type of model. Picture No. 5 shows Ehling's model with which he made his remarkable flight.

One of the most active groups of gas model builders comes from Brooklyn, of which Leo Vartanian is a member. He placed third in the Gas Model event with a flight of 45 minutes, 50 seconds. A beautiful view of his model in flight is shown in picture No. 6.

Picture No. 7 shows a group of models which Vartanian and his friends brought to the contest. In this picture they are busy assembling them for flight.

Joe Kovel was delayed slightly in getting his model under way. Many of the contestants had their eyes on this ship and were wondering what it would do. They had heard much about it. Finally Joe brought out his ten foot job, powered with a Brown engine. It weighed 6¾ pounds. He tuned it up carefully and it took off the runway after a short run. It climbed steeply against the wind, stalled slightly and with a sudden dip to the left swooped toward the upturned faces of the crowd. The people scattered in all directions, allowing enough space for the model to pass within one foot of the ground, clipping the grass. However, it rose without being grounded and continued in broad circles getting higher and higher. After this first thrill it was apparent that Joe's model was "going places." Over the middle of the

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airport it struck a current of air and climbed at a steep angle, under engine power at the same time. It wasn't long before it was 2000 feet high, just beneath some clouds which had formed. The breezes freshened at this moment which carried the ship quite rapidly away from the field. A number of the contestants and people watched it through telescopes until it was lost to sight. However, Joe had prepared himself well for he had a car ready in which he and the timers followed the model. Another car accompanied them. During this wild dash after the model a blow-out occurred, which forced them to change to the second car, in which they continued the chase. Finally a second blow-out brought them to a stop. At this time the model was 3000 feet high and it had been in the air 1 hour, 4 minutes, 40 seconds at the time the watch was stopped by the timer. It disappeared in the direction of Philadelphia. Two days later Joe and other members of the Bamberger Aero Club learned that the model had landed in Metuchen, New Jersey, which is located in the opposite direction from that in which the model was proceeding when last seen. It is estimated that the model covered a distance of at least 35 miles. The actual time of the flight was unknown. The official time of 64 minutes, 40 seconds gave Joe first place in the contest, as well as the distinction of breaking the two world's records; the record for ⅛ ounce of fuel per pound of weight and the one for ¼ ounce per pound of weight of the model. Joe has been working for the past two years to accomplish this feat.

Placing in this event also gave Joe the distinction of being the highest point winner of the Bamberger Aero Club, for which accomplishment the Club will send him to the National Contest to be held at St. Louis, Missouri, June 27, 28, 29th.

Picture No. 8, at the head of Air Ways, shows Joe's model which now holds the world's record.

Picture No. 9 shows it in flight after leaving the ground.

The Gas Model Event provided many other thrills, especially in the nature of crashes. An unusual model was brought to the field and flown by Leo Weiss. His ship was by far the fastest model at the contest. Its speed was estimated to be about sixty miles per hour. It took off with a rush, made a sharp left turn and swooped down viciously at the crowd, which dwindled and spread in all directions. Upon its second swoop it landed squarely on the bicycle of a young onlooker who had the presence of mind to roll away quickly before the model struck. Not two minutes before this incident, these young men were warned about such a happening and had been ordered to keep at a safe distance. They neglected to do so, with the result that one young man was minus a good bicycle. The model was cracked up beyond the hope of further flight.

An example of nosing in on a turn may be seen in picture No. 10.

Picture No. 11 indicates the excitement of the crowd upon the unusual take-off of one of the gas ships.

There were many other interesting gas models at the contest which lack of space prevents us from describing here. How-

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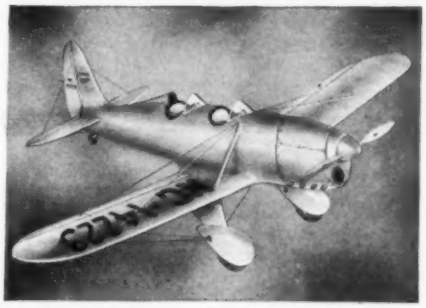

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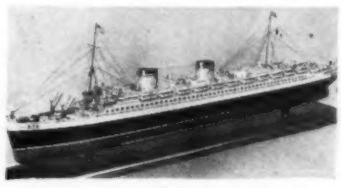

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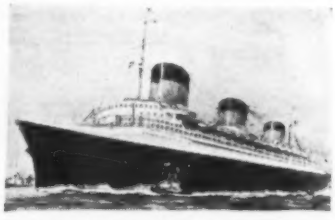

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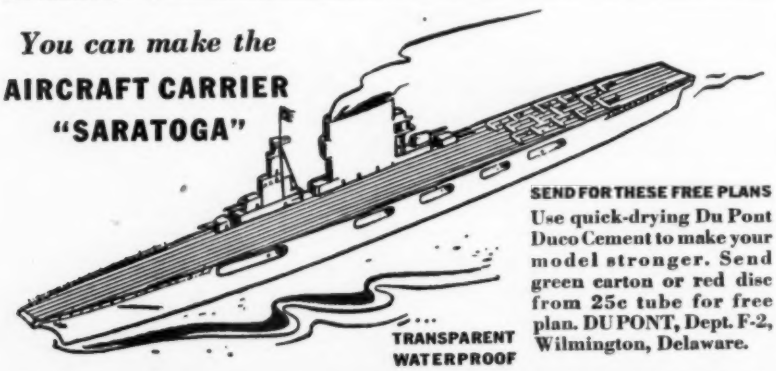

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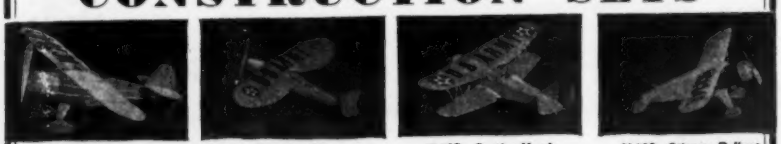

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ever, in our next issue we will print more views of some of the unusual ones.

Picture No. 12 shows Mr. Nathan Polk, one of the directors of the contest and the director of the Bamberger Aero Club, in the process of weighing in a gas model plane.

Picture No. 13 catches Mr. Grant in the act of scaling up John Haw's fuselage model. Insomuch as the weighing in and measuring process is one of the most important factors in official flights, the directors took every precaution to make certain that models were eligible and according to National Aeronautic Association rules.

The contest ended at 6 P.M. Even the contestants themselves were awed by the flying displayed during the day and few "kicks" of any kind were registered. At the end of the contest the winners gathered in the hangar and were awarded the trophies. In the Fuselage and Twin Pusher Events large trophies were awarded for first place, smaller trophies for second, and a beautiful silver plaque for third place. In the Glider event an unusual trophy was offered for first place, which was in effect half a globe upon which a beautiful figure stood holding an airplane. A smaller trophy was offered for second place and a plaque for third place. In the Free For All Event the winner had a choice of one week's vacation with all expenses paid at Mr. Grant's model airplane camp in Vermont or a silver trophy. Salem Barrack, who won first place, chose the silver trophy insomuch as he is moving to Syria in June, where he intends to reside permanently.

With the establishment of unusual world's records at this contest the National Contest which is to take place in June will undoubtedly be intensely interesting. The records give something very worthwhile for the "Nationals" contestants to endeavor to break. They should make competition keen.

Two of the most important factors in the smooth functioning of any contest are a sufficient number of judges and stop watches. There was no lack of either of these at the Eastern States Contest. For this we wish to extend our greatest appreciation to the gentlemen who devoted their time to the pleasure of the young contestants and to the success of the meet, to say nothing of Miss Mary Walker, secretary of the Bamberger Aero Club, who acted as chief recorder, and the corps of young women Girl Scouts from the Baten High School Aero Club who acted as general recorders for the various events in a most efficient manner. They were of great assistance. Some of those who acted as judges were: Lt. H. W. Alden of the National Aeronautic Association, John Hulstrunk of the Newark Recreation Association, Victor R. Fritz of the Philadelphia Model Airplane Association, who flew from Philadelphia to be on hand, Irwin Polk of the Junior Birdmen, Harry Pack of Model Aircraft Engineering Company, William Winters and Robert Morrison, contributors to MODEL AIRPLANE NEWS. William Brown, designer of the Brown

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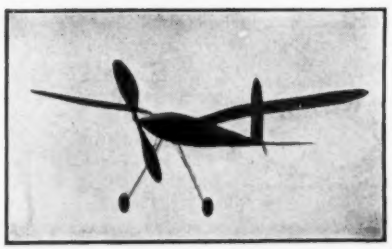
engine was kind enough to be on hand and gave great assistance in helping contestants with balky engines and gave them many valuable pointers concerning the engines and their operations. He also acted as timer. Mr. Ralph Derr of the Junior Motors Corporation, was also on hand to encourage and assist the boys in the operation of their gas motors. There were many other judges, the names of whom we have no record at present and to whom we wish to extend our great appreciation for their generous co-operation. Mr. Lawrence Shaw, director of the Junior Birdmen, was on hand to lend his co-operation.

A. G. Spalding Company loaned their invaluable co-operation by supplying a sufficient number of stop watches to insure a smooth operation of the contest. We wish to extend our appreciation to this concern and to Mr. Stapleton, who made the arrangements.

SPECTACULAR



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By the co-operation of all these people they have contributed materially to the future success of many young budding aviation engineers and future members of the industry. Such contests go a long way toward preparing young men to engage in an active life. They are rendering a real service to the country. The following is a list of the winners and the events:

TWIN PUSHER CLASS C

	Time
Jack Haggerty Reading, Pa.	18:58
Robert Gable Reading, Pa.	12:20
Merrell Malley, Atlantic City, N.J.	11:32
Walter Skokna, Irvington, N.J.	8:05
George Aspiotis, Atlantic City, N.J.	7:19

GAS MODEL

Joseph Kovel, Brooklyn, N.Y.	64:40
Robert Long, Reading, Pa.	47:20
Leo Vartanian, Brooklyn, N.Y.	45:50
Frank Ehling, Jersey City, N.J.	35:06
Bradford Noble, Waterbury, Conn.	27:28

GLIDER CLASS C

Edgar Franklin, West New York, N.J.	:40
George Brown, Jersey City, N.J.	:35
Henry Hohner, Newark, N.J.	:35
Salvatore Ippolito, New York, N.Y.	:33

FUSELAGE CLASS D

	Time
William Ying, Rosebank, S.I., New York	41:19
James Throckmorton, Atlantic City, N.J.	20:30
John Ginnetti, Atlantic City, N.J.	17:22
Henry Struck, Jackson Heights, New York	14:14
Walter Skokna, Irvington, N.J.	9:58.3

FREE FOR ALL

Salem Barrack, Brooklyn, N.Y.	16:08
William Wert, Philadelphia, Pa.	15:04
George Brown, Jersey City, N.J.	14:04
George Aspiotis, Atlantic City, N.J.	14:15
Martin Faynor, Newark, N.J.	10:00

GAS AUTOGIRO

William Effinger, Brooklyn, N.Y.	:02
Gerald Smith, Brooklyn, N.Y.	:01

Unquestionably, many of the readers will be interested in hearing something of the contestants and models which prevailed. Most of the twin pushers were of orthodox design; small plane in front, large plane in the rear. It seemed to be the practice to make the area of the front wing 1/3 to 2/5 the area of the rear wing. Some of

(Continued on page 44)

Douglas Mailplane M-2

(Continued from page 26)

while the fuselage and tail surfaces are of welded steel tubing. At the time these ships were built, they gave a very creditable performance with the heavy Liberty engine of wartime design and were rugged for cross-country flying. They packed a full load of 1,000 pounds of mail and this ship was instrumental in determining the design of later mail planes used on the privately operated mail routes.

The private airlines when they took over the Government-operated routes, acquired these ships and derived much valued service out of them under private routine. Some of these ships are still in operation today and the United Air Lines use several for training pilots in blind flying routine.

There were four series of these ships constructed and all were basically the same, the only differences being of minor nature. It is well to recall that these ships were equipped to carry passengers, four in number in place of mail if the necessity arose. The cockpit arrangement was interchangeable to do this.

It is well to note in the design that all the aerodynamic indications of good application of theory are present. Today certain Douglas biplane observation aircraft still retain certain characteristics of these planes. Recently these planes saw extensive service in filming the movie scenario "Night Flight" where really excellent views of this type of craft are to be seen.

A model of this plane in the original color scheme, using the Western Air Express colors and insignia, will produce a pretty model. Since the ship is of orthodox construction it should be easily duplicated in model form, particularly in the solid variety.

It must be borne in mind that this plane was the first really successfully operated high-performance mailplane that the Government ever employed and was the granddaddy of our modern high-speed mail ships of today.

An American Wakefield Entry

(Continued from page 19)

will not describe them in detail, but will give reasons for using the specific aerodynamic elements.

Fuselage

The elliptical cross-section and monocoque construction fuselage was used to minimize resistance, to obtain sufficient strength for the large motors, to eliminate any possible torsional tendencies, and to show that we can also make good-looking models. Besides having small drag in a level flight, this shape has only about 1/5 the drag of a square fuselage when the model has an angle of attack of 0° and up.

To copy bulkheads and ribs from the drawing, place balsa under the drawing with a carbon paper between the drawing and balsa.

Tracing over the bulkhead or rib outline on the drawing will impress the exact outline on the wood.

Wing Bridge and Landing Gear

Wire was used for the bridge and landing gear as it has least resistance for its strength, and also because the incidence of the wing can be very easily changed by bending the proper struts, and also the landing gear does not have to be removable for packing. Last but not least, the wire landing gear struts give few more seconds by giving an illusion that the model is still flying by bouncing the model up when it lands.

Rudder

Rudder was built as an integral part of the fuselage to make the assembly and flying as simple as possible. Partial balsa sheet covering strengthened the rudder considerably and at the same time retained the settings. Its area was calculated by Directional Center method. "D.C." on the drawing means Directional Center, the center of side area of the model. You will notice that it is in the rear and above the "C.G." Always try to have it at this point on your models.

Stabilizer

The area of the stabilizer was calculated

so that the model would never climb more than 10 degrees. The reason for this was that the wing loading was too great. It is kind of dangerous to trifle with burble points with a heavy job. M-1 airfoil was used as it allows large enough spars and still have small profile drag. Notice the balsa sheet covered center and the method in which the stabilizer is attached to the fuselage.

Wing

The choice of the wing's airfoil section was one of the main worries until the R.A.F. 32 was discovered in an N.A.C.A. report book. This section is ideal for high wing loading. It has good lift, low drag, high L/D, and a fair Center of Pressure (C.P.) travel. What more do we want? You will notice that there is comparatively little dihedral on the wing, but since it is used in combination with sweepback and parasol, the desired lateral stability was assured.

The sweptback wing was used for the following reasons: it decreased the dihedral; it brought the C.G. of the wing in line with C.P. (Center of Pressure or Lift) with consequent results that the wing may be moved forward, and its position on the fuselage predetermined as all we have to know is the C.G. of the fuselage. The sweepback also permits streamlining of end ribs which decreases the tip losses and aids in longitudinal stability by having a higher burbling point than the rest of the wing.

The parasol was used to simplify the wing mounting on the elliptical fuselage to permit changing of the wing's incidence, and to minimize eddies caused by the slipstream of the prop near the proximity of the fuselage and the wing.

The strength of the wing was tremendously increased by the boxlike construction in the center. This feature also permits rough handling and prevents the rubber loops from shattering the center section covering. Also notice the centering of the center spar which assures uniform airfoil by not contracting the upper or the lower camber, as happens when the spar is flush with the cambers. The small notches on the front and rear spars also strengthen the structure and simplify the assembly.

Performance of the Model

The winding is accomplished by removing the front plug and stretching the rubber motors as much as possible and winding them up by the "S" hook on the lower motor. Use spaghetti tubing and safety hooks wherever needed to prevent slipping or tearing of the motors. On the original model, the adjustments were such that the model turned with the torque; just a slight left turn on the rudder and just enough washin on the right wing to prevent the model from banking too much from the torque tendency.

The model behaved exactly as it was designed to. The prop duration was over three minutes. The ship never climbed steeper than 10 degrees, but it kept climbing higher and higher until the last turn. Glide was as should be expected from a streamlined job. On test flights, on a warm and sunny day, the model would take off the ground under its own power and land

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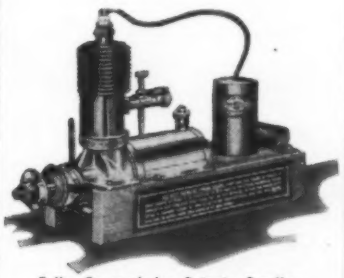

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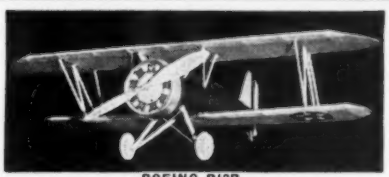

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1" diam.	pair .08
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⅛x3/16	8 for .05
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¼x¼	6 for .05
3/16x3/16	6 for .10
3/16x¼	6 for .11
¼x⅜	6 for .12
¼x½	6 for .13
⅜x⅜	6 for .14
⅜x½	6 for .15
½x½	6 for .16
½x¾	6 for .17
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18" Sheet Balsa

1/32x2	2 for .03¼
1/16x2	2 for .04¼
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1x3x36 .30	2x6x36 .85
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2x3x36 .45	

Prop Blocks

¼x¾x15	5 for .05
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⅜x1x7	3 for .06
⅜x1x26	2 for .07
½x1½x8	3 for .08
½x1½x10	2 for .09
½x1½x11	2 for .11
½x1½x8	2 for .11
½x1⅝x11	2 for .12
½x1½x12	2 for .13
½x1½x12	2 for .15
½x1½x14	2 for .17

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.045 sq. 25 ft. .08
3/32 flat 25 ft. .10
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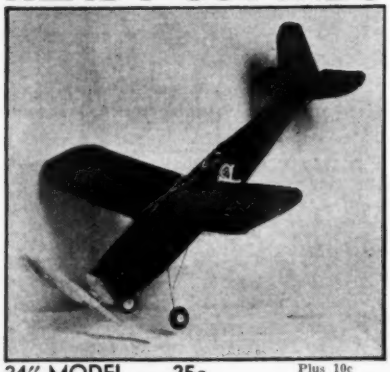

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dead-stick with only 250 initial turns.

The twelve-hour job of covering the fuselage with balsa sheets was repaid by the strength the body had when it was completed. For example: the fuselage stood up under slamming back of fully wound 18-strands motor at least four times with no other injury than knocking out a flake or two of balsa in the rear. And it was none the worse after a deliberate stall close to the ground. In fact, the model is still intact after crossing the Atlantic twice (in a packing case). No trouble was experienced with the gears as ball bearings and ample bearing surface were used.

Wakefield Contest Time and Notes

Flight No.	1st	2nd	3rd
No. Turns	1450	1500	1650
Time	63 secs.	65 secs.	127.5 secs

Average 85.2 secs. Place 3rd

The model was given a test flight later on in this country and the best time established was 170 secs. in an evening air.

It is useless to speculate on what the model could have done under more favorable conditions than those present at the contest. It is much better to devote the time in designing a ship that will fly under all possible weather conditions.

Conclusion

It is not the purpose of this article to give specific details for reproducing an exact replica of this model, but rather to disclose several worth-while design and constructional features which have been accumulated by the writer for several years.

A Flying Model of the Consolidated Fleet Trainer

(Continued from page 11)

strands of 3/16" flat rubber or four strands of ⅛" flat. Flying wires, instrument boards and other scale effects may be put in as this model has a tremendous lift. Paint the nose and all the struts blue. The cylinders are painted with black ink and the rocker heads and propeller are painted silver.

Test the model by first letting it take off. If the model is correctly built, you will be able to obtain flights of one hundred to two hundred feet.

Secrets of Good Model Building

(Continued from page 13)

the single edge types probably being best because they have a good firm backbone, which makes them easy to hold and use. When the supply consists only of the double edge type, it is well to break them in half lengthwise, and fold a strip of adhesive tape along the broken edge to furnish a grip and protect the fingers. Many modelers favor a small holder into which the blades slide and which holds them tight and safe. Many types of holder are available to the builder at very reasonable prices, or, if desirable, they can be quite easily made. (See Figure 7.)

A metal-edged ruler should always be used when cutting strips with a razor blade, as the sharp edge will quickly ruin a wooden one.

While we are on the subject of tools, a few words regarding those used for working balsa are in order. Besides the razor-blade cutter, a knife is handy for many uses that require a little more substantial blade. Also, propeller carving would be one terrible job with a razor blade. The knife should have a large and a small blade, and it goes without saying that for cutting balsa the blades should be as sharp as it is possible to get them.

Various sizes and shapes of sandpaper blocks are very handy, together with an assortment of sandpaper grades, from the finest to the very coarsest.

A large pine board of about one foot by three feet and an inch or so thick, and quite smooth and flat, is essential for assembly work. Don't use it for cutting or any other work but assembling and gluing, as the surface must be preserved. The various units are drawn to scale directly on the board and the pieces assembled over the drawing. When the board gets too covered with all sorts of drawings it may be well sanded to obtain a clean, smooth surface again.

As mentioned above, the outlines of various parts of the models may be drawn directly on the board and the wood strips held in place by pins. The pins must not be stuck through the pieces, but simply braced against the edges. The best pins, incidentally, are those called "T head" pins. The common kind of straight pin is rather hard on the fingers when being pushed into a moderately hard board.

The glue is applied to each piece before it is set in place to insure its being all through the joint. Do not worry about getting the glue between the board and frame. If this happens, leave it alone until dry, then it is very easy to slip a razor blade between the two and cut the glue. The glue cuts very easily since it is tough but not hard or brittle when dry. A sheet of wax paper may be laid down before the work is started, but, while this will prevent the frame from sticking to the board, it is quite a nuisance and seems to retard the drying of the glue.

. . . . . .

If our readers, and especially the beginners, are interested in this type of article, they will be continued from time to time to cover other phases of model building, considered from the beginner's viewpoint.

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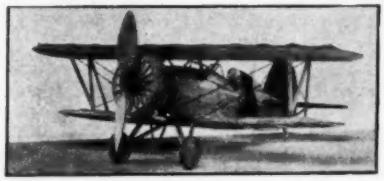

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Airplane Observers Contest Winners

(Continued from page 17)

present his titles accurately and neatly. He is extremely interested in various phases of aviation, especially in models. His face is familiar to many of the boys who are present at contests in the neighborhood of New York. David Keller, second place winner, does not say anything in his letter about his interests. Jack Canary, fifth place winner, is well named; considering he is extremely interested in flying. He attributes his knowledge of planes to the fact that his hobby is taking pictures of all types of them.

One of the outstanding personalities in the contest is Bifl Metzger, who won ninth place. This young man has had the misfortune to have been bedridden for the past five years. Bill helps to pass the time by making use of his intense interest in aviation. He builds models, makes excellent drawings and corresponds with other model fans who care to write to him. We suggest that some of you model builders get busy and write to Bill. He will appreciate it extremely. Reid Patterson, eleventh place winner, is a collector of photos of airplanes. This, unquestionably, was of great help to him in presenting an excellent entry.

We have received many interesting letters from other contestants.

Probably many contestants have wondered why their entries were not listed among the winners. Perhaps if we point out a few general mistakes it will be helpful. Most of the trouble occurred with the answer to picture No. 3. It was clearly stated in the rules that the model number of the machine was necessary as well as the name. Mr. Rampey, the winner, has been careful enough to give the manufacturer's name, type of ship, Department of Commerce number, name of the ship and the model number. He has certainly been thorough in giving his answer. Several contestants entered the answer: Mister Mulligan D.G.A.-6 without the quotation marks around "Mister Mulligan." These quotation marks are part of the name, without them it means something entirely different.

There were several entries that were very elaborate, artistic and, one might say, beautiful. However, in the rules it clearly stated that all entries would be judged on their accuracy, simplicity and neatness. The winners, therefore, were chosen purely upon the merits of the entry slip which they presented, exclusive of any elaboration or artistic embellishment. Rampey's slip was simple, neat and accurate. The contestants should note that this was a contest for naming ships presented in a proper fashion, not a contest for artistic work or originality.

A great quantity of entries have arrived at the office for contest No. 2. Results of this contest will be presented in our next issue. Do not fail to read about it.

MODEL AIRPLANE NEWS is not only pleased that these young men have won the prizes given in this contest, but they are sure that all who participated have gained some useful information concerning the great industry and pastime of aviation.

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7"	$ .45 each
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On The Frontiers Of Aviation

(Continued from page 15)

and dependable. The development of greater traffic volume is of course the main factor remaining to be considered. If such a bill was proposed and passed authorizing airlines to carry first-class mail (with a minimum distance of, say, 100 miles), practically every aircraft factory in the country would have to work at full capacity in order to meet the demand! Our present number of 600 transports would soon reach the thousands! It would put great numbers of people to work. Mail could be transported from New York to California in a day for three cents instead of the present six cents. One can readily see the enormous progress aviation would make if such an air mail system was formed, and most important of all our airlines could realize a profit on such a set-up! The development of a high-speed cargo plane carrying only mail and express would be one of the important results.

This matter is of grave importance to the boy in school who intends to become an aeronautical engineer or hold a position with some air-transport company later in life. The industry must expand with greater rapidity in the next few years to make room for the new arrivals from college. Therefore it is necessary that one should watch with great interest the air mail developments in England and help as much as possible in bringing such a system to this country. It would mean even greater success to the airplane designer or executive than is now offered by aviation. The extent of aircraft development has not reached its maximum, and it will not be long before there are planes cruising at 300 m.p.h.!

How to Build A Scale Model of the New Army Pitcairn Autogiro PA-33

Get dimensions for purchasing wood from plans. Balsa wood should be used in building the model. If you wish to square off the plans, connect the corresponding dots on the border with a pencil. Each square will equal one square foot. Ambroid, dope, a razor blade, sharp chisel, sandpaper and jig-saw will be needed to make the model.

Draw side view of fuselage on stock and cut with jig-saw. Then draw on top view and cut. Round out the fuselage, including engine cowl with chisel and razor blade. Sandpaper thoroughly. Refer to fuselage cross-sections.

Cut out the rotor blades with razor blade and streamline as shown by sections E-E and F-F. Cut out the tail units in the same manner. Sandpaper all parts to smoothness.

Next make all struts and housing for rotor gears from solid balsa, and ambroid (glue) in place on top of fuselage. Cut the panels for the windshields to shape with razor blade and connect these also to top of fuselage. Cellophane or isinglass may be ambroided to the panel to make the windshield more realistic.

Shape out landing gear next with your razor blade and ambroid to fuselage. The wheels, which may be made or purchased, may be connected with a small straight pin inserted through the center of the wheel and into the strut.

Join the tail sections to fuselage and connect rotor blades, applying plenty of ambroid, to a small round wooden disc. When connections have dried, ambroid the rotor blades to model.

Carve the prop from scrap wood and connect to front of fuselage with straight pin. Go over all connections with ambroid and sandpaper the whole model thoroughly. Apply several coats of dope, the color being optional. The model will then be completed.

Make This Scale Model Glider From Scrap Wood

(Continued from page 7)

shape and cemented flush underneath the wing. The position for this fillet piece is shown in the side view by a series of dotted lines.

The landing gear (wheel pants) are next cemented in place and have a tread measuring 1-5/16". The upper wing is next to be attached. Push a small pin through the center of the wing part way into the fuselage to hold it steady while you cement the wing struts in position. Later remove pins.

Check now for gap, stagger, and dihedral measurements taken direct from the drawing. Attach the wire launching hook shown by letter L. This is cemented underneath the fillet piece shown by letter I.

Next, cement the rudder and elevator parts in position. Be sure that the elevator lies horizontally and does not drop to one side. For the nose weight use lead foil or heavy silver wrapping which will hold fast when cemented. If you are to paint the model do so first, then placing the correct amount to nose weight in the position shown by the letter K.

The propeller is used for show only and should not be mounted on the model when launched by slingshot.

Departing from the usual procedure, the color scheme of the model glider as shown in the photograph follows: the wings are white with red scalloping along the leading edge of the upper surface of the top wing. The rudder is black with

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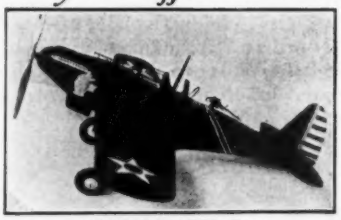

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red scalloping on the fin; elevators white; the fuselage is black. The cowling is all yellow as is the stripe which continues along the fuselage. Windows, wing struts and landing gear are white.

Now if you can visualize the exceedingly attractive color scheme of this silhouette-o-plane, we have no doubt that you will want to start at once.

All parts shown in the plan are indicated by letters and are listed below with their respective dimensions:

A. Wing, 1/32"x15/16"x6-1/2" (two pieces, upper and lower wings)
B. Fuselage, 3/32"x1-3/32"x4-5/16" (side and top view view of body)
C. Elevator, 1/32"x15/16"x2-13/32"
D. Rudder, 1/32"x13/16"x1"
E. Wheel pants, 1/16"x23/32"x1-1/16" (two pieces)
F. Wing struts, 1/32"x1-1/8"x1" (two pieces)
G. Tail wheel, 1/16"x1/4"x1/4"
H. Upper wing rib, 1/32"x1/16"x15/16"
I. Fuselage fillet, 1/16"x3/32"x15/16"
J. Propeller, 1/8"x1/8"x1-5/8"
K. Nose weight position
L. Wire launching hook
M. Slot for elevator
LE. Leading edge of wing

The Development of the Fokker Fighters

(Continued from page 9)

trailing edge was wedged spruce nailed and re-enforced with aluminum strip. Unbalanced ailerons were fitted to the rear spar and cable controlled. Covering was stressed skin plywood.

The tail assembly again resembled that of the Fokker Dr.I, but with certain modifications for the type. Instead of the comma rudder of the triplane, the V.25 boasted a triangular fin to which was attached the balanced rudder. A horizontal tail surface identical to that of the triplane was fitted on the V.25.

In matter of performance, the V.25 was probably in the 110-120 m.p.h. range. Landing speed was estimated at 50 m.p.h. and climb in 10 minutes, 10,000 feet.

While the V.25 did nothing in defense of Germany, it was an interesting experiment in which one of our most "modern" constructional devices was proved. The detail in point is known as stressed skin construction.

Whereas in former Fokker cantilever wings, the whole load had been delegated to the spars and ribs for support, the V.25 wing was built lighter in its internal structure and the plywood covering strength figured in the final ability of the wing to support its load. Although this theory was not a new one at the time, it had never met favor among designers who considered the husky wire-braced structure of a biplane or a monoplane the only practical cellule.

Second of the new machines for March 1918 was a parasol monoplane known as the V.27, shown in Figure 5. This machine was built from the same forms as the V.25 with but minor alterations.

The parasol wing in which there were 32 ribs attached to the two box spars, was supported from the fuselage by four pairs of steel struts. Two outer members on either side were attached to lugs on the lower longeron and to spar fittings on the underside of the wing. Attached to the front spar on either side were two short struts mounted from the top longerons and engine bearers, the latter holding fittings for the forward pair of struts.

As in the V.25, the wing was covered with stressed plywood and fitted with nonbalanced ailerons. In order to aid visibility and access to the cockpit, the trailing edge of the wing was cut away over the pilot. The empennage was identical to that of the V.25.

A standard two-wheel wire-braced landing gear carried an airfoil covering over the axle.

Perhaps the most distinctive feature of the V.27 was its fuselage and power plant. The skeleton was made up of the usual four longerons of steel tubing, welded and braced with piano wire. Except for cowlings, fabric was used for covering material. Because of a peculiarly shaped radiator which was round in character, the fore part of the body was nearly round, tapering to the rectangular section just behind the fire wall.

The propeller shaft of the Benz "V" type 8-cylinder motor projected through an opening in the radiator. This engine of about 180 hp. as well as similar models put out by Basse-Selve and B.M.W., was a direct copy of the Hispano-Suiza motor so successful in Allied planes.

Performance figures of the V.27 compiled from official reports should prove very interesting. Its speed at 6,600 feet, the altitude which German officials set as a standard for comparison, was 128 m.p.h., and time of climb to that altitude 5 minutes, 35 seconds. Landing speed in spite of rather high wing loading was nominal: 55 m.p.h.

But because of weight distribution, the V.27 was stiff directionally, and handled badly in tight spots. It was unable to "hang" on its propeller as did the D.VII and when the stall was reached, the nose whipped downward with a tendency to spin. Armament of the V.27 was two Spandau air-coooled machine guns mounted on the top cowling in front of the pilot.

With but few alterations, the V.27 might have been well suited to ground attack work and put into service as a "contour fighter." Such work does not require climb or high altitude, but speed and fair maneuverability. Although just another experiment, the V.27 proved conclusively the value of the parasol type in point of visibility.

It was in June 1918 that Herr Junkers, one-time aeronautical partner of Anthony Fokker, produced his first single-seater fighter to be accepted by the German officials and put into service. The designation was the D.I and this machine was developed from the Junkers-Fokker J.7 produced in March 1918.

Figure 6 shows one of these machines warming up at Evere Aerodrome, where a fleet was stationed during the last three weeks of the War.

Points of interest are first the all-metal construction in which the covering was riveted to stamped bulkheads in the same manner as modern Douglas airliner fuselages are constructed. Secondly, it is interesting to note how the pilot is protected from being crushed should the D.I turn over on its back. In place of the headrest popular in 1918, a tall tubular superstructure is included, high enough to keep the weight of the plane

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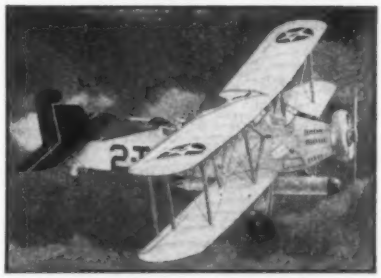

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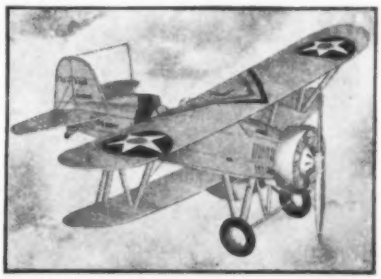

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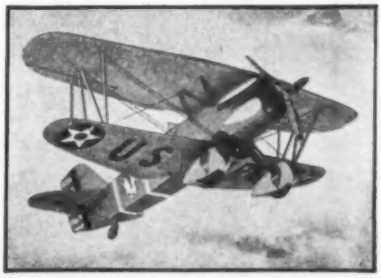

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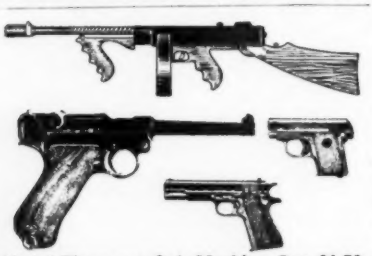

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Cable controls were done away with in the wings, and in their place, direct rod and cam movement was fitted. In this manner, the D.I was practically fireproof and bulletproof in that its material and control agents were indestructible by these hazards.

And like most German airplanes, the Junkers-Fokker D.I was a fairly large machine. Wing span was 29'2", length overall was 22' 3".

Contrary to popular belief, the D.I was not used as a pursuit plane, but as a contour fighter. Its job was to attack ground troops, perform light bombing missions from low altitudes, and to harass Allied troops on the march. Consequently its speed was high, approximately 140 m.p.h., and rate of climb very low, less than 600 feet per minute. At the same time, the D.I had a very low service ceiling, at which the rate of climb was 100 feet per minute: 12,000 feet.

Protection from above was provided by a dirty brown coat of camouflage paint applied to the top surfaces of the wings and tail planes, and to the fuselage sides. The plane, as viewed from below, was painted a light cream-blue for purposes of protection. Two Spandau machine guns and in some cases bombracks, comprised the armament.

While industry prepared for the support of von Ludendorff's great and final push on Paris, Fokker produced his most interesting War product, the Fokker D.VIII monoplane. The fifth monoplane accepted by the German Air Service for Front use, the D.VIII was originally called the E.V. The story of the E.V., its redesignation, D.VIII, and experimental machines up to the Armistice will be told in the final chapter of this series.

Air Ways Here and There

(Continued from page 38)

the front wings, however, were as small as ¼ the area of the main supporting surface. All of the twin pusher wings were paper-covered and were attached directly to the frame. No machines were of the high-wing type.

In the Fuselage Event standard construction prevailed. There were a few ships with tail booms. The wings of most of the models rested directly upon the top of the fuselage. A few of them were of the high-wing type. The amount of dihedral used for the purpose of stability, generally speaking, was considerable, amounting to at least two inches rise at the wing tips for every foot of span. Several of the models had a double dihedral; that is, a wing was dihedralled at the center and again turned up still further half-way out from the center to the wing tips. As usual, the Clark Y wing section was the most popular.

In the gas jobs there was a great variety of design. Some machines had fat, short fuselages; others long and slender ones. Some had square, straight wings, others gracefully curved and shaped. The designs which proved to be the most successful of all embodied one important feature; and that is, that the center of gravity was coincident with, or above, the center of lateral area of the fuselage and the projected area of the dihedralled wing. Whether these designs embodying this important factor, were created deliberately by the designers, is not known. Many of the designs which crashed lacked this feature, which is probably the cause for the disaster. When the center of gravity is too low the plane will start to spiral, which spiral becomes tighter and tighter until it strikes the ground.

One of the finest planes, from the stability standpoint, was that of Leo Vartanian. His motor was placed high in the fuselage to insure a high center of gravity relative to side area; and the wing was of the parasol type, which insured a low center of gravity relative to the wing. The stability of this ship was unusual. It was strange but true, that Robert Long's ship also embodied this excellent factor. Joe Kovel's job was another one of this class. The ships which won universally used a medium high or high wing section which insured a flight which was not too fast. These ships, instead, possessed soaring qualities. Most of the ships which crashed were of the design in which the center of gravity was well toward the bottom of the fuselage. This condition existed because of the fact that the motor, batteries and coil were placed close to the lower longerons.

The fact that there was quite long grass on the field did not hinder takeoffs, for a runway of roofing paper was unrolled to form a smooth surface for models getting under way. The wind changed frequently which made it necessary to change the direction of the runway. However, because of its character this was easily accomplished.

Mr. James Condon, one of the contestants at the field, was unfortunate enough to have lost a gasoline engine. This engine was left in his bag and while he was away occupied with flights it disappeared. Will anyone who knows of the whereabouts of this engine please notify the editor of MODEL AIRPLANE NEWS? It is with deep regret that any such incident should occur to mar the sportsmanship and the success of the contest.

CLUB NEWS

Holman Model Airplane Club

St. Paul, Minnesota, now boasts of a model airplane club of fourteen members which was organized last October. Mr. Gordon Schindler is one of the directing spirits. Picture No. 14 shows a group of club members with a gas model Boeing 95 Mailplane, powered with a Brown engine. The club members are very much excited over test flights which will take place shortly. The model was built by the two boys kneeling at the extreme left of the picture. Members of the club will appreciate hearing from other clubs.

Syracuse Model Airplane Club

Picture No. 15 shows a model exhibit which was recently held at Dey Brothers Department Store in Syracuse, New York, by the members of the Syracuse Model Airplane Club. The boys of the Club spent over 2000 hours building the planes shown.

They were on exhibit for a week and were of interest to several thousand people. The model featured in the middle is a Waco Taper Wing biplane built by Louis Casale of Sherwood Avenue. It required fifteen months to construct and won the National Scale Model Contest at Akron, Ohio, last year. It has a wing spread of twenty-four inches and is complete even to gas and oil tanks, which actually contain gasoline and oil. The model cost $75 to build and the finished plane is valued at $500.

Connecticut Model Airplane Meet

As this issue goes to press, the Connecticut Model Airplane Meet to be held at Hartford, June 8th and 9th has just taken place. The contest is sponsored by the United Aircraft Corporation of East Hartford, Conn. Mr. J. E. Lowes, Jr., is in charge of the model division. Very attractive prizes are being offered. Some of the Directors of the meet are: Governor Wilbur L. Gross, Adjutant-General William F. Ladd of Connecticut; Hiram Percy Maxim; Ex-Governor John H. Trumbull; Donald L. Brown; President of the United Aircraft Corporation; Eugene E. Wilson, President of the Chance Vought Corporation; Raycroft Walsh, President of the Hamilton Standard Propeller Company; Bernard L. Whelan, President of the United Airports of Connecticut; and George S. Wheat, Vice President of the United Aircraft Corporation.

Official sanction for this contest has been procured from the National Aeronautic Association. Builders who have followed model airplane flying for a number of years know this association to be one of the oldest in the country. This contest is staged annually and it is with extreme interest that model airplane fans note that the men prominent in commercial and military aviation are finally taking an interest in and recognizing the value of the great sport and hobby of model airplane building and flying.

Soaring Society of America

This year promises to be an outstanding one at Elmira, New York, where the Sixth Annual National Soaring Contest is being staged beginning June 29th and continuing on through to July 14th. To date many pilots and clubs have indicated to Contest Manager Earl R. Southee that they will be on hand when the sunrise gun is fired on June 29th. Some of them are:

Chester Decker, Donald Hamilton, Ben Levine, George Malouin, John Hulstruck, Dr. Frank Gross, Dr. Wolfgang Klemperer, Miss Gretchen Reighard, Dick Randolph, The Intercourse Gliding Club of Intercourse, Pa., Elmira Gliding Club, Professor Roswell E. Franklin, Art Rahn, Eaglerock Gliding Club, Wolcott Osborne, Speed Westphal, Detroit Gliding Council.

Three American soaring champions will compete; Jack O'Meara, '32, Stanley Smith, '33; Richard du Pont, '34. O'Meara will fly his "Chanute" and also his Franklin, in which he was recently towed from Miami, Florida, to Havana, Cuba, and return. Smith will pilot a new 1935 Bowlus-du Pont utility glider; and du Pont will fly the "Albatross 1."

One of the events of interest to model builders which is being planned and which will be held during the Glider Contest at Elmira is a Gasoline Engine Model Contest. One of the oldest model builders in the country, Percy Pierce, is organizing and will direct this contest. All gas model fans should take note of this and endeavor to be on hand with their planes for this event. The topography of the country, without question, will insure some interesting flights.

Junior Aviation League

This club in Boston, Mass., keeps its members well informed, as well as many other model builders who are intensely interested in model building, with their weekly paper, "Wing Overs." It is through this medium that we learn that Captain Brown will soon resign from the League to accept a directorate at Hampton College, Virginia. Captain Brown has lent invaluable assistance in building up the club and in furthering the art of aviation through model building.

Recently the Annual New England Indoor Contest was held at the Boston Garden. The League successfully defended their model reputation by taking twenty out of a possible twenty-four places in this, the sixth annual contest. Boys and girls from Massachusetts, Connecticut, Maine and Rhode Island were present. There was great enthusiasm shown.

In the Outdoor Contest which was held Barbara Maschin and Bob Shea won first place. Shea of Roxbury, Conn., flew his fuselage R.O.G. model and his two-lined glider to two first places. Repeating her work of last year, Barbara Maschin, an

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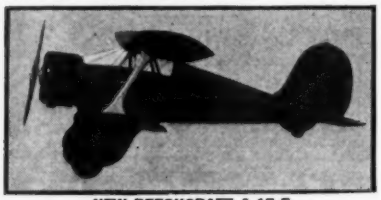

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outstanding girl flier of the country, took first place in the Hand-Launched Stick Type Event. Her time was 30 minutes, 20 seconds. The contest was held at Harvard Practice Field, Sunday, May 26.

Model Airplane League of Ontario

Mr. John T. Dilly has been kind enough to send us news of activities in Canada. The Guelph Model Aircraft Association, under the leadership of W. D. Tolton, held their first contest about two months ago. The results were as follows:

In the Semi-scale Junior Event, E. Griffin was first and D. McIntyre second. In the Senior division, D. McArthur was first and Tom Olson second. W. D. Tolton won the Open division. The R.O.G. Senior Event was won by E. Barrie and A. Smillie was second. Tractor, Open, was won by E. Barrie and J. Meyers second.

The most important contest to date, however, was the Sixth Annual Hamilton Indoor Meet held under the direction of Edward S. Booth. Mr. Dilly says this gentleman cannot receive too much credit for his connection with this work. The winners of the contest are as follows:

R.O.G. Event—Ernest Housland was first and Clarence Dunn was second. Both of these contestants are from Hamilton.

Flying Stick—Ernest Barrie, first, and John T. Dilly, second. These contestants are from Galt.

Semi-scale—Melvin Bardsley of St. Catherines, was first and Owen Cornfield of Port Dalhousie was second.

Scale—Basil Vansickle of Hamilton was first and John Perok, also of Hamilton, was second.

Bakersfield Aero Engineers

This club is particularly interested in gas engine models. They have been experimenting with one recently, which has been designed by Denton Stockton. It has a span of seven feet, eight inches and is powered by a Brown Jr. motor. The club was organized about a year ago by Francis A. Stewart, now commander of the club and Clyde R. White, one of the engineering officers. The gas job has not been thoroughly tested as yet. It is expected that it will be equipped with an altitude control, working on the altimeter principle with the aid of an electromagnet. The purpose of this is to keep the model in sight and prevent its loss. I am sure that readers will be interested in knowing whether or not this device proves successful.

A. M. Ronald of Minesing, Ontario, Canada, writes the following notice: "I am a keen collector of aircraft snapshots and would like to get in touch with other fellows in Canada who are the same, with the idea of forming a club for exchange purposes. I would suggest that all early members have at least fifteen size 116 negatives, which will produce good, clear snaps of different type aircraft. If all those interested will write, I will be glad to answer, giving further suggestions.

Jacksonville Model Club

Jacksonville, Florida, now has a model airplane club which they can be proud of. There are over 100 members at the present date. Recently a large contest in which about 60 of the club members participated, was held. Prizes were donated by merchants and friends of the club.

Judges for the contest were Major H. A. Maloney, Laurie Yonge, and E. R. Chattin, Jr. The contest was held at the Jacksonville Municipal Airport on June 1st. The following members won first places in the various events:

Harold Wolff, Richard Reynolds, Milton Smith, George Atkinson, John Lesse, Edwin Troy, Harold Weeks, Milton Meyers, John Williams, William McMinn and Pulaski Broward, Jr. The longest flight of the meet was made by George Atkinson with a stick model which flew 26 minutes, 6 seconds before it was lost in the clouds. We do not know whether or not this is an official world's record.

An Automatic Variable Pitch Propeller

(Continued from page 28)

The angular sketch of the completed hub and parts is drawn oversize for greater clearness, and should be used only as a guide in assembling the pieces. The propeller shaft is secured at the front of the hub "A" with a single square bend and a drop of solder. A chart marked in degrees, is shown to assist the builder in locating the slots.

The idea is to adjust the tension of these springs "S" so that four-fifths of the total motor winds are required to compress them and "close" the propeller. For example, if 300 safe turns may be wound on the motor, the prop should remain in "high" pitch, (see drawing) up to 240 turns. The remaining 60 turns compress the springs, (see "low" pitch) causing a faster take off. As the motor tension decreases, the propeller shifts again into high pitch.

The Aerodynamic Design of the Model Plane

(Continued from page 27)

Then $N^3 = 31.4$. Taking the cube root of (31.4), $N = 3.78$.

Thus, the number of strands to use to obtain twice the duration is 3.78. However, it is not possible to use fractions of strands, so in order to obtain a motor cross section area equal to 3.78 strands of 1/8 x 1/30, it is necessary to use approximately fifteen strands 1/32 x 1/30, or eight strands of 1/16 x 1/32 rubber. You will find this method quite accurate. From this, it can be seen that the duration is nearly inversely, proportional to the number of strands.

Now on the other hand, if you know what the duration is of an eight strand motor and you wish to determine what the duration of a six strand motor will be, it is right to assume that it will be a little less than 8/6 of the eight strand motor. By the formula the problem is solved by substituting (8) and (6) for (N) and solving for (E). The relative proportion of (E_1) to (E_2) will show the relative durations.

However, you can determine the relative durations of any two motors if you know the maximum torque and the maximum number of turns that can be stored in each one, by using the formula $E = \frac{T}{\sqrt{Q}}$.

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For example, if the torque of motor No. 1 is (9) and the turns equal 400 and the torque of motor No. 2 is (16) and turns equal 200, then:—$E_1 = \frac{400}{\sqrt{9}} = 133.3$ and,

$E_2 = \frac{200}{\sqrt{16}} = 50.$

Dividing (E_1) by (E_2), we have 2.67 or the duration of motor No. 1 is 2.67 times the duration of motor No. 2. However, do not forget that this condition exists only when the same type, pitch, area and diameter of propeller is used.

Multiple Motors

Extreme competition among model builders to obtain flights of great duration has stimulated them to search for various means that would make their motors turn the propellers for a longer period of time. One of the ways to accomplish longer duration that appears obvious to many model builders is by the use of multiple motors, geared to a single propeller. However, most fans overestimate the increase in duration produced by such arrangements. Usually, there is a slight increase, ranging from 10% to 23%.

In order to understand the reasons why the increase in duration of motor action is so slight, it is necessary only to consider a few facts. First of all, we have shown that in a motor of a given length the duration (E) is inversely proportional to the number of strands in a motor, approximately. That is, if a motor of eight strands has a duration of 16 seconds, a motor of the same length composed of four strands will have a duration of 30 seconds. (The time will be about 1/16 less than being double.) Thus, approximately $E = K\frac{L}{N}$, where (L) represents the length of the rubber motor. The longer the motor, the greater are the number of turns it is possible to store in it, and consequently the greater the duration will be.

Now, in order to see what there is in this idea of multiple motors, suppose we take practical cases and follow them through. In the diagram on page No. 27, the upper figure shows one eight strand motor driving a propeller. The torque (Q) delivered by this motor may be represented by the formula $Q_1 = K\sqrt{N^3}$. Substituting (8) for (N) and considering that K = 1, the torque proves to be 22.48 units. Now, suppose we divide the eight strands up into two motors of four strands each. Then the torque equals $Q = 2\sqrt{\left(\frac{N}{2}\right)^3}$, where (N) = 8 and $\frac{N}{2} = 4$. In this case Q = 16 units, which is only equal to about 70% of the one motor of eight strands. Now in order to have the series of motors produce an amount of torque equal to one (8) strand motor, the amount necessary to fly the plane, another motor of four strands will have to be added. This will bring the total torque of the three motors to 105% of the one eight strand motor. However, by the addition of the one extra motor and the gearing required, considerable weight has been added to the model. Usually a motor weighs at least 20% of the total weight of the model. so by adding four strands, (½ motor), the total weight has been increased 10%. The gearing in the average cases equals about 10% of the total weight of the plane. Therefore, the weight of the model has been increased by 20%, not to say anything of the increase in the weight of the frame structure of the ship, which will result from the enlargement and strengthening of the parts in order to stand the extra rubber and gear weight, as well as the added rubber torque and tension. It is reasonable to say that the weight of the structure would have to be 10% greater. Thus, the model is 30% heavier and the motors develop only 5% more torque. This in turn is more than absorbed by the added friction of the gears, so we may say that the power is the same as in the original plane.

Here we have the condition of 30% too much weight for the power, so one more motor of four strands must be added to fly the added weight. Now, we have four, four strand motors driving the propeller, developing 135% of the power of one eight strand motor. 5% more of this is easily lost by gear friction so the plane has only 130% of the original power. With the addition of the 4th motor, the model becomes 10% heavier again and the framework still heavier, which adds at least another 5% of weight.

Therefore we have our plane 130% + 15% = 145% heavier than originally. It is simply a case of the more power, the more weight, and the more weight, the more power. The whole system builds up on itself until the final weight is about 50% greater than originally. The last 5% is due to more rubber that must be added to carry the last 15% of weight added. This last addition of rubber delivers about 15% more power so that the weight and power have both increased to a total of 150%.

Now there is another point to consider, the speed of the plane has increased about 22.5% due to the 50% increase in weight. The propeller speed has therefore increased 22.5% or the duration for any given number of turns is only 81.7% of the original duration with one eight strand motor.

Due to the fewer strands in the motor, it is now possible to obtain more turns and more duration, however. The increase in the number of turns is about 42.5%; adding 42.5% of 81.7% to 81.7% we have 35% + 81.7% = 116.7%, or the duration of the model with the geared motor has approximately 16.7% greater duration than the model with the single eight strand motor.

Summing up our results, we have a duration increase of 16.7%, a weight increase of 50% and a speed increase of 22.5%. More than twice as much rubber is used. Actually five motors of 4 strands each will have to be used or 4 motors of about five strands.

There is one other point we have not considered yet. All of this addition of weight has increased the wing loading as well as the total weight of the model. This means that the sinking speed will be increased and the effect of rising air currents on the model will be reduced. Both of these factors cut down the duration of the flight considerably. At least 10% duration is lost, if not as much as 20%. So after subtracting this from the 116.7% duration, it is apparent that we are back just about where we started, with the one eight strand motor.

In order to be sure to get sufficient power in flight, it is the best practice to use six strands on each of the four motors of this type of system. The added friction, weight and speed absorb a large amount of power. The duration of such a system of motors will be about 110% of a single motor system, an advantage of 10% not considering reduced "floating" qualities.

Many builders may continue to feel there is an advantage in this type multiple motor but it is believed that after a little experience with this form of power generation, they will return to the simpler system of single motors. It has been the experience of the author that geared multiple motors especially of this type, are not advantageous.

Next month other forms of multiple rubber motors will be considered. One system is illustrated in the third figure of the diagram. This system will give an added *motor* duration of about 20%. The advantage in *flight* duration is doubtful.

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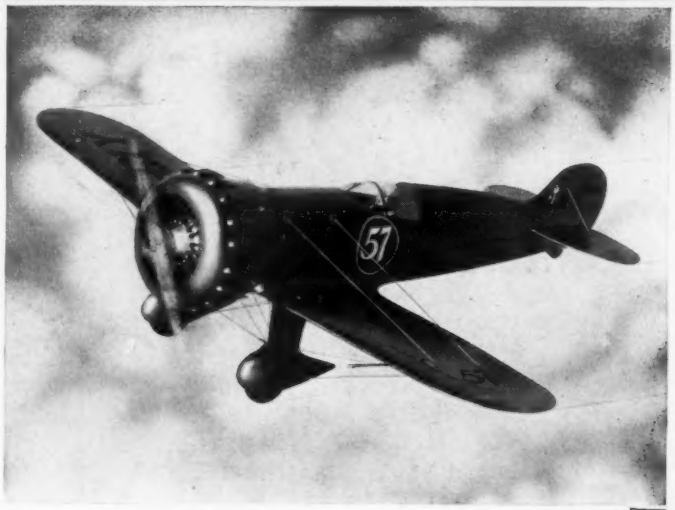

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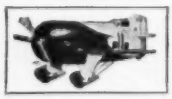

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